

# ziane b alojayyan

*by* Zaine b Zuhair A ALOjayyan

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**Prifysgol Cymru**  
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**A social media prototype for home energy use  
display.**

by  
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Project submitted as part of the requirements for the  
award of BSc (Hons) Computer Networks

April 2016

## DECLARATION

I, Zaineb Zuhair Alojayyan declare that I am the sole author of this Project; that all references cited have been consulted; that I have conducted all work of which this is a record, and that the finished work lies within the prescribed word limits.

This work has not previously been accepted as part of any other degree submission.

*Signed : .....*

*Date : 21 of April 2016*

## FORM OF CONSENT

I Zaineb Zuhair Alojayyan hereby consent that my Project, submitted in candidature for the B.Sc.(Hons) Computing & Information Systems degree, if successful, may be made available for inter-library loan or photocopying (subject to the law of copyright), and that the title and abstract may be made available to outside organisations.

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*Date 21 of April 2016*

## CHAPTER 1

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**Abstract** — fortune in encouraging behaviour changes is often conditioned to the selection of interferences. This research explores about the social media advantages of interferences to promote energy saving awareness. A survey has been done by social media to indicate users about their lifestyle, thoughts about energy saving.

### ➤ Introduction:

Energy is an important part in our life. The Plant life cycle depend in growth through solar energy, human bodies need food to maintain the energy, humanity depends on energy to have electrical power, transportation and manufacturing. In this project, we are hopefully going to provide some aspects about energy in deferent areas: What is the concept of it, how has the energy developed through the past years, why it is essential to our life and the historical side of energy resources. The main part of this chapter is to explain the physical and major side of energy concepts. The other part is going to discusses regeneration of energy and how these sources have transformed to energy utilized by people. (1)[Jaina L. and Zachary A., 2007]

Amongst the business and academic area the interest of changing human behaviours are growing to reduce energy use and raise sustainable outcome, in addition, details about the range of impacts that resulting from the behaviour change approach and platforms.(38)[Axon, Bright, Dixon, Janda, and Koloktroni, 2012] When energy technology produce the systems more efficient, energy consumption that attribute to resident turns up more intrinsic, and in some conditions it might be given greater conservation expectations. (39)[ Sullivan, M. and Sullivan, F] However, the non-technical energy decisions about behaviour and the culture change in the work sites are not visibly known and were not appropriately explored. On the other hand, the technical portion, technologies have the ability to work in various functions in the mission of benefits behaviour change. (42)[ Lara S. G. Piccolo, Harith Alani, 2015]

In this literature review, it will illustrate some different aspects about energy and how human behaviours have influenced our planet. The aim of this work is to encourage people in using less energy as possible as they can and watch their behaviours, otherwise, using alternative methods of energy. Furthermore, exploring how social media can affect people behaviours in energy efficiency.

### ➤ Definition of energy:

**What is energy mean?** It can be a little weird to ask someone that question but, if you have some ideas about energy it is possible to discuss. (7) Klaus Rennings, Bettina Brohmann, Julia Nentwich, Joachim Schleich, Thure Traber, Rolf Wüstenhagen (2013 More recently, the concept of energy adopted to be as a substance. For people how would like to gain a further information about the history of the concept of energy, as well as the development of these conceptions through the centuries. (13)[Ralph Zito, 2011] What is the concept of energy? *"Energy is a capacity for movement or change in a physical or biological system"* (2)[Guy C. Brown (1999)]. Work is an appropriate thought in itself. The concept is the best beneficial way to understand the concept of energy. There are abundant methods of energy; the overall concept of energy is hard to define. However to describe some exact forms of energy is possible to do. The concept of work of doing some work supports greatly in creating such definition. (3)[David C. Cassidy, Gerald Holton, F. James Rutherford, 2002]. In science, illustrate the energy as" the ability to perform work or cause changes"(4)[Stephen Butz, 2015]. In different way, energy concept will be the movement of something form place to another.

➤ **Resident behaviours and energy uses:**

Recently, studies have substantiated that the human habit is not less important as the physical properties of the house to influence the energy uses, the carbon emissions from residences that heavily dependent on human behaviours, is the most influence to the domestic temperature change.

**(40)[Scott Kelly, 2013]** Between smart meters and social media, and now there are further data under the disposal of companies more than before. Regardless of the large quantities of "social information" that produced via social networks such as Facebook, LinkedIn, Instagram and Twitter. Through social media consumers have the ability to express their opinion easily in front of number of audience about any topic.

In the modern life electricity have been the primary feature and if there is any issue in its provision which then become a cause of resentment. Being able to respond directly to customer claims through social media and thereby can be remarkable and interesting for companies. Edison studies has suggested that those who complain through social media, they look forward to see a reply in 60 minutes thus the key is to stay on for this effective listening **(41)[Karel Beckman, 2015]**.

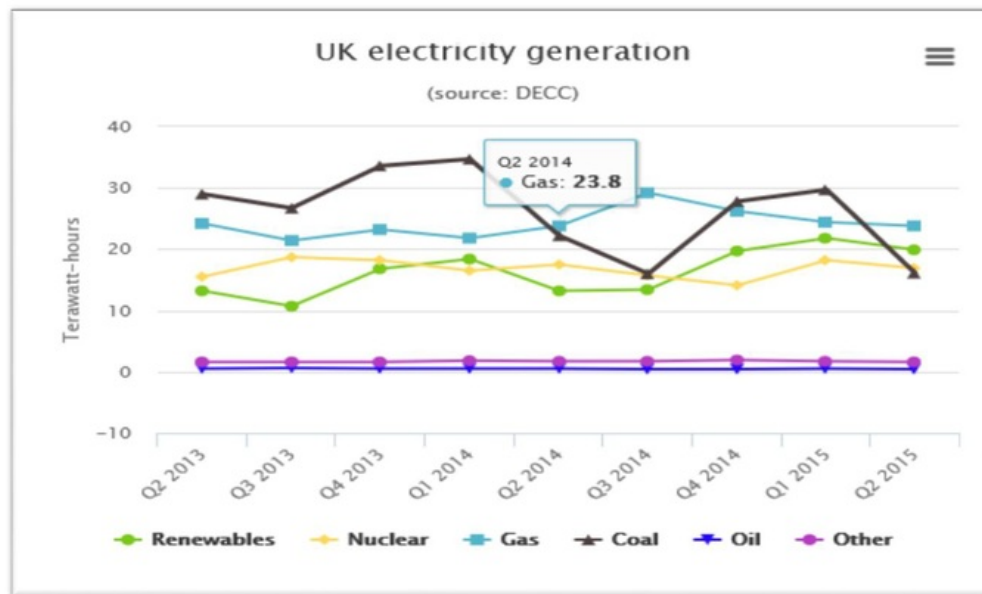
In recent times, more people who interested for positive comments through social media than negative ones, for instance, by social sites displayed successful stories and information that raise more than disasters related to climate changes, or issues about, saving energy. **(43)[Lara S. G. Piccolo, Harith Alani, 2015]**.

### ➤ Renewable energy:

The international energy agency describes renewable energy as "*energy that is derived from natural processes that are replenished constantly. In its various forms, it derives directly or indirectly from the sun or from heat generated deep within the earth*" (21)[Katrin Jordan-Korte, 2011]. Generally, defining the renewable of energy differs between companies and countries. Some different definitions for renewable sources are producing serious points of view as the coverage of appropriate renewable energy sources can create good differences in carrying out of renewable promotion and activities. This is essentially due to that the defining of renewable energy is used in different ways of connection.

In general, renewable energy refers to sources which would be used as energy resources without their eventual depletion. For example, the renewable energy working party of the international energy agency has agreed about the following definition: (5)[Youn Chen, Nordic Council of Ministers, 2004] is described as an energy produced by using nature sources such as light from the sun, wind, rain and waves that as would naturally expected to be replenished within a time distance of a few years. (6)[Henrik Lund, 2010]. Renewable energy gives an improvement in comparison with other fields of environmental science in order to extend the modern technologies that are developing daily in the area. In the U.S. the energy technologies focused directly on taking out coal and crude oil, however the latest technologies that started to participate to the total energy consumption. (20)[Anne E. Maczulak (2009)] In the second quarter of 2015, the record in the UK launched that is one quarter of the Britain's electricity derived from these sources, Wind solar, hydro and biomass energy. In Britain, most of electrical energy generated from renewable sources more than from using coal and that happened for the first time in 2015, since then wind and solar fields were established. (22)[Emily Gosden, 2015]

Figure:



On the other side, lately Saudi Arabia has been warned by a study has released that Saudi Arabia's need to be aware of alternative sources of supply energy and mainly because to cover the increasing of energy needs that met in high rates to reach 4.4 per cent yearly until 2035. According to Saudi Press Agency (SPA), these increases from energy needs will require 350 million tons of oil per year. in order, to keep the natural resources in the country, the requirement to find out for alternative energy sources is fundamental. (24) [Saudi Gazette, 2015]

As is the case in other developing countries, the high requirement of electricity is major reason of the total growth from domestic production of energy by 8% which in extremely high. In order to meet the needs of air conditioning, however, the requirements of electricity in summer season is about 40% larger than in the winter time. The peak demand of energy is vary usually between night time and day time. Due to this, the total energy capacity must be noticeably above the basic needs. (35)[Eckart Woertz, 2013]

In November of 2011, Saudi Aramco Company has declared that they under a joint project with Showa Shell, and their plan is to begin of solar cells production within 2 to 3 years in Saudi Arabia. However, if Showa Shell's technology will be introduced into Saudi Arabia by Aramco Company, which means would be a considerable contribution in the country's main objective of manufacturing variety. Showa Shell Company specialises in manufacturing the solar cells by using copper, indium and selenium. However, the substances are not identical as the solar cells manufactured from polysilicon but, it is lower in cost. And this will be probably the key factor in future. **(25)[ Reuters, 2012]**

Most countries and the UK one of them need to gradually raise their uses of renewable energy. However, in the UK the history of production for energy was based to natural wealth resources. Up to now, coal, oil and gas are the source that relies on it to supply energy to homes and transport station. **(23)[Coalition Government, 2010]** Based on the latest research, in the UK there is a need to increase the renewable energy usage. At first, the threat of climate change drives us instantly to the need of reducing the dioxide carbon emissions and other global warming gases.

- For renewable energy growth, the UK has devoted to supply 15% of its energy needs from renewable energy sources by 2020, however, **(37)[HM Government, 2009]**

### ➤ Solar Energy/Renewable:

As mentioned before, Energy is something we cannot live without in our life. Energy can be related to everything in life. There are many different sorts for energy, and energy is very important for heating, electrical, and light. Solar Energy considered as one of the high impact solution to enhance the existing electricity shortage in countries. The process of solar energy is the transformation from sun Rays to electricity form. As soon as the sunlight has fallen along the solar panels will convert to the electric power remains to flowing. The gained energy is stoked into charging battery with the help of charge controller (11)[Saha, Sohag Kumar; Habiba, Ummay, 2013] Energy renewable systems considered to be used in order to assess the environmental effect of different actions for generating materials for instance, when the bigger amount of energy is needed, that means the higher influence on the environmental side. (12) G. N. Tiwari, Rajeev Kumar Mishra, 2011]

Now a day, the technologies of renewable energy can decrease the co2 emissions by way of changing the fuels in manufacturing and transportation segment. On account of several negative external influences and irreparable in traditional energy production, it is substantial to improve and encourage the technology in renewable energy resources and request for it. Power generation should be increasing by using renewable energy supply for the reason to reduce the cost. (19)[Heshmati, Abolhosseini, Altmann, 2015] In contrast, solar power can help to make global warming slow. Fortunately, several years ago of studies have directed to dynamic solar panel schemes that electricity generation without causing greenhouse gasses. Nowadays, solar power generation is obviously one of the important solutions to greenhouse. (31)[Zachary Shahan, 2013]However, there are some advantages and disadvantages of solar panels:

### ➤ Advantages:

- By solar energy co2 emissions will not be produced and also is an effective way to limit supply and the cost of fossil fuels. So, solar energy can be perfect alternative for high prices in fuel and impacts global warming phenomena. (34)[Ellen Christoforatu, 2012]

➤ **Disadvantages:**

- **The lack of efficiency in production:** currently, the criticism issue about solar energy is that it is not relatively efficient. The efficiency of solar energy indicates to the quantity of radiation that solar panel can be converted into electrical energy, and that is approximately 20%. So, a large area will be needed to produce a lot of electricity. Notwithstanding, solar efficiency still in a steady improvement and it is estimated to increase through the next years. **(32)[Daniel H, 2013]**
- Electricity produced from solar energy cannot be generated in the night. Solar panel depends on high levels of sun rays to run competently and thus it is incapable to generate electricity in the dark. that problem can be improved in some countries that has shorter days at various times during the year but also can be mitigated through the introduction of batteries system that can store any energy produced through solar panels during the sun light to be used in the night. However, this type of method can be used in some household solar power systems. The batteries would need more space but, it is most common to see in the solar tools such as garden light. **(33)[James Bratley, 2013]**

In addition, latest technology in order to use solar energy to produce electricity is photovoltaic and this can be more beneficial than solar energy. The Cells in this technology make the transformation directly from the sunlight to be electrical energy. Also in countries where it has comparatively low solar radiation around the year such as Germany, according to theory, this can provide higher than the amount of electricity needed. Down side of photovoltaic systems, is an electricity supply instituted fully on photovoltaic method is impossible because it will produce overflow of energy in the sunny times which will need to store at substantial costs. To combine between photovoltaic systems with another renewable energy generators for instance, wind energy and hydropower. This will allow the demand for electricity to be free of co2 emissions, and also to avoid any high costs and storage capability. **(36)[Volker Quaschnig, 2005]**

### ➤ Energy consumption and the effect of it on human life:

During the previous decade or so, it has been an enormous of social and natural systematic discussion about the environment concerns of current consumption. *"It is clear that lifestyles, especially in the West, will have to change if there is to be any chance of averting the long-term consequences of resource depletion, global warming, the loss of biodiversity, the production of waste or the pollution and destruction of valued 'natural' environments"* (7)[Klaus R, Bettina B, Julia N, Joachim S, Thure T, Rolf W, 2013]. To understand the historical movements and changes in global energy consumption is the key for grasping the difficulty of energy use in our day (8) [Jaina L. Moan, Zachary Alden Smith, 2007]. Additionally, energy consumption can be defined as energy supplied to the end user for all energy usages (9)[ United Nations. Economic Commission for Europe, 2007]. The aim of energy performance principles is to decrease building-related energy consumption in new houses (10)[Olivia Guerra Santin, 2010]. In the past, more than two million years human had known to use some tools made from stone like, sharp knife, the axe considered to be one of the oldest tools was used at that time. These tools let the implementation of fairly small quantities of energy supplied by muscles through small space and also shorter time, for example, it illustrated a high average of energy usage and power. (16)[David Coley, 2011] However, Food was the biggest important source of energy for human. Energy consumption had been growing as the development of society. The table below *Table 1.1* shows the energy consumption for human as a daily bases and six terms of community changes. In the past, cooking takes as fact to be the sole source of energy, food had the higher priority of consumption by a human during the time called "Primitive". Energy is necessary for natural life, and food had been the first source to explore energy. During hunting time people was capable to control fire and which allows them to use the heat and cook. Fire also was used for lighting at night and can light up caves and places. The wood was the only source of energy consumption and it was used in a resident location. (14)[John R. Fanchi, 2004]

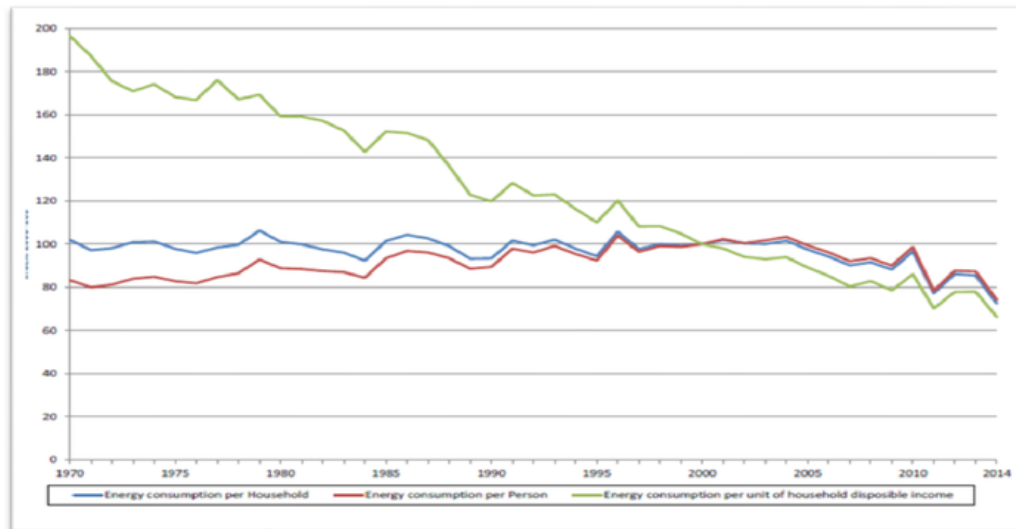
• *Figure1: Table 1.1*

| Historical <b>energy</b> consumption |                                          |        |         |                |       |
|--------------------------------------|------------------------------------------|--------|---------|----------------|-------|
| Period                               | Daily per capita consumption (1000 kcal) |        |         |                |       |
|                                      | Food                                     | H & C* | I & A** | Transportation | Total |
| Primitive                            | 2                                        |        |         |                | 2     |
| Hunting                              | 3                                        | 2      |         |                | 5     |
| Primitive Agricultural               | 4                                        | 4      | 4       |                | 12    |
| Advanced Agricultural                | 6                                        | 12     | 7       | 1              | 26    |
| Industrial                           | 7                                        | 32     | 24      | 14             | 77    |
| Technological                        | 10                                       | 66     | 91      | 63             | 230   |

\* H & C = Home and Commerce.  
 \*\* I & A = Industry and Agriculture.  
 Source: Cook, 1971.

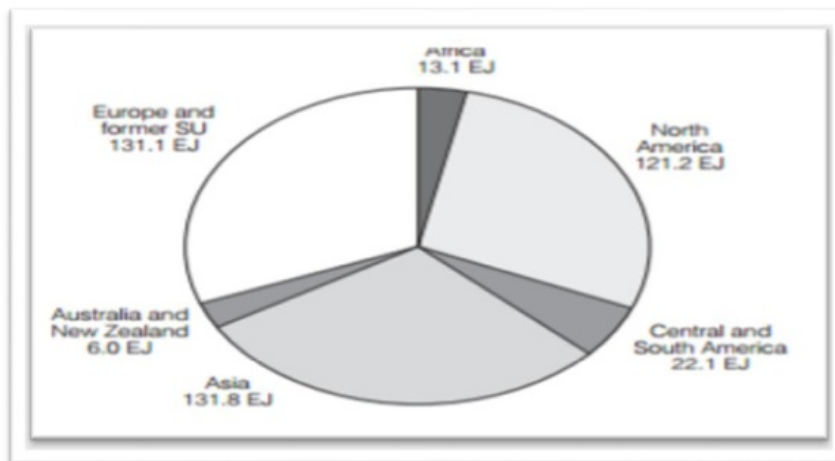
In the meantime, energy consumption has been totally changed than before through the growing in lifestyle, buildings and technology revolution. In the UK, factors that affect domestic energy consumption contain several of families, taking in consideration for the energy efficiency of families, the family's income and population. These elements possibly can use to calculate the intensity of the energy in the household section and that displays in the chart below *Figure2*. Since 2000, the energy consumption per unit of households of their income has decreased by 34%, whereas the consumption rate of energy per domestic has dropped to be 27% and the consumption of energy per individual has dropped by 26%, which represents an increase in energy efficiency. In comparison with the year before, in 2013 was recorded that the energy consumption per person and household dropped by 15%. (29)[**Victoria Goodright, Emily Wilkes, 2015**]

• *Figure2.*



Furthermore, Global energy needs will remain in growth in the prospective future. Also, population in the world has been appointed in growth through coming decades. Studies expect that by the year 2050 the energy request will rise in rate of 2.3 to 4 in comparison to the previous years. This will make the problem more intense which already exists these days and its effects, such as the impact of global warming and the high depletion of fossil energy resources. Demand for energy of the continents is completely various as outlined in **Figure 3**. For essential energy need, the pie Chart shows that both Asia and Europe surely have the same demand of degree. (30)[**Volker Quaschnig, 2005**]

*Figure 3: World energy demand by Region in 2001(30):*



Nevertheless, the residents in Asia is higher than Europe by six times and ten times than US, the overpopulated and the continents in less-growth, such as, South America and Africa, contain a very small part of the world initial energy request. (30)[Volker Quaschnig, 2005]

### ➤ Energy and climate change:

All communities demand energy uses to come across human requirements like, cooking food, transport, network and many other things in our life to meet industrious course. Energy quality is sustainable for improvement process. One of the baggiest affected challenge people are living nowadays is climate change produced significantly by human who caused gas emissions, reducing energy consumption is within the important problems to prevent global warming and create friendly environment of energy technology is important to obtain the goals of how to protect the environment and energy security. (15)[Halime Ö. Paksoy, 2007] in this section the aim is truly on how energy impacts the climate changes. Climate changes are within the most important concerns in our life. Although there is an increasingly agree that humans beings are the main reason behind the climate changes in this world, Scientists are allocated according to how serious the problem and the need of the policy response. From scientific side any work approach includes at present time's communities will undertake the cost because it deviates from the current situation and all advantages of their efforts would take place essentially in the future. (17)[David G. Victor, 2004] The connection between energy and building expenses perhaps is diverse in summer and winter time. Insulation and storm windows such a features in buildings which can make a difference for reducing energy in seasons change. Building Insulation features are alternatives for energy expenses in different time of year (18)[Joel B. Smith, Robert O. Mendelsohn ,2007] China is the biggest and fastest economy growth worldwide. No matter where, the environmental importance is needful and it should become one of very important issues. Because it is responsible by 19% of the world co2 emissions by 2005, because it is responsible by 19% of the world co2 emissions in 2005, and is the biggest place for co2 emission, climate change in the future will be influenced the economy stabilization. Moreover, China has turned to be the elder in global economic and the centre for economy plans. It's probably would influence the other economies behaviour. (27)[Roger Fouquet, 2013] In China, as mentioned before there is a high relationship between energy and economic growth. In the late 1970s without making reduction of energy density, without a reduction

in energy intensity since the late 1970s however, to support economic growth in the country, they needed to consume 3 times of the energy. In the centre of China's 11th Five year Plan the goal was to reduce the total energy density of the economy by 20%. This goal has been implemented to response the increasing in energy density between 2002 and 2005. And that was the first increase within several decades of rapid decline in energy density. To reflect the high increase in energy density, the government has released the national campaign to encourage in energy consumption; their goal was especially for the biggest and lower consuming-energy companies. And this plan was focusing in the highest companies to improve the efficiency which they were about 1000 companies and they consume around one-third of energy in the country. (26)[Joanna Lewis, 2011] thus, China facing a challenge in how to achieve balance between emissions-density growth and reduction-carbon emissions, china trying to share some experts from UK to help in balance. In order to do so, opportunities exists for economic long-term growth. This collaboration between China and UK can support the UK to take an advantage in how reducing-carbon expertise. In 1990, the carbon emission in China has increased from 2.8 billion tonnes to 9 billion tonnes in 2011 which means 20 per cent of the world emissions. The international agency has rated that half of the emissions comes from China's energy growth until 2030. Nonetheless, if China succeeded in making lower growth rate in carbon and reducing emissions and that's possibly can reduce the risk of global warming to 2c.(28)[Parliament: House of Commons: Energy and Climate Change Committee, 2012]

## CHAPTER 2

## ONION CHART:



In this chapter will be presenting the following aspects:

- **Literature review:**

The literature review data has been generated from multiple sources from internet, books and some people in the unit such as, *Lana and* the data from the university project called (start-up weekend).

The structure of the literature review chapter has divided into five areas related to the project topic to discover how energy importance to our life and effective. What's more, the aims of the literature review are to discuss the topics and illustrated any issues in the region and present it to make some possible solution. In view of that, presenting any further researches in the area and debate it.

- **Research Methodology:**
- **Research method hypothesis:**

This project will determine the benefits of making use of social media. The hypothesis aims to test the relationship between increases in home technologies devices and how much that affects the growth in the home energy efficiency and uses. However, the research method will be based to be survey and experiment. Thereby, expectantly to base the overall of the survey outcomes and that can be one of the effective ways for collecting individual behaviours about the home energy habit. Survey methods consider to be one of the most commonly used methods in the social sciences to recognize the ways of how societies work and to experiment theories of individual behaviour. Realistically, surveys are a pivotal foundation in societies that based on modern information. Most of energy companies use questionnaire to estimate the behaviour of energy uses. Nonetheless, now a day the number of people who are using social media as a part of their life is growing day by day. Thus, choosing social media to base the survey in such as, *face book*.

However, there is also going to be an experiment method in my personal house and that will be following how much energy I do use during one week and how much is the difference in term of reducing the energy usage by changing the routine or looking after the behaviours approach of our energy uses for the next week. Thus there is a comparison between the two weeks and evaluate how considerably the changes will be.

- **What research methods will you use? (Survey/Experiment Methods)**
  - ❖ **Survey:** As mentioned before, one of the methods will be based on this project is a survey method. In order to determine the basic social backgrounds concerning the individuals, a demographic questionnaire will be used. The questions however will be formulated in such a way that they will enable the researcher to solicit the information that mainly focused more on the information such as the age, educational status, marital status, gender, current income levels and the employment status. It mainly consists of four items which are in short

paragraph format. This type of questionnaire was selected because of its briefness and simplicity for the individuals who participated in the research to fill out. Since the project topic about the home energy usage it would be appropriate to questionnaire number of people about their uses and collect some data and make any comparison. *(Some of the data used from my proposal)*

- The objective of the survey is to display statistics, and qualitative and quantitative characterization about some aspects of the study residents.
  - The ultimate way to collect the data is by way of questioning the people however, the answers are the data to represent and analyse.
  - In general, the information is collected about only a small part of people, which will be, a sample, rather than from every member of the population.
- ❖ **Home Experiment:** on the other hand, a small experiment will take part to examine the home energy usage during two weeks and compare the differences between the two.

## • Results and Evaluation:

### 1. Evaluation method:

As most people nowadays, from both younger and older generation are using latest technologies and social media movements. The method design is an online survey through social media website. The method is going to be on measuring in how the difference between the answers and organizing the results, how each question responded, highlighting some key point of view, what is the highest/lowest result that users applied. Correspondingly, analysing the result is all about how far the samples are comparable or divers to each other and lastly presenting the data in Tables or Charts. The survey objectives are to examine and show the result of how much people using technologies and devices in homes and how far they aware of home energy.

### 2. Data gathered (qualitative, quantitative)

The data will be collected from both quantitative and qualitative. The aim of the survey determinations the gathering method, the societies to be incorporated in the survey process, the types of questions asked, and many other elements. The Objective of the survey will has to be to

gather objective, unbiased data from a typical individual of residents. One helpful step to take up front is to outline what you want to learn from the survey and how the results will help the team improve their processes. The survey should concentrate on the enhancement of processes rather than characters.

### 3. Data presentation and analysis techniques (statistical methods, charts, graphs):

Analysis is one of the main aspects of the survey research project. In this stage, the analysing data can be taken from the majority of respondents. However, one of the vital thing is to clarify how many and how far the difference between the answers and illustrate between them. Additionally, data presentation will display in a table such as the example in figure 1.

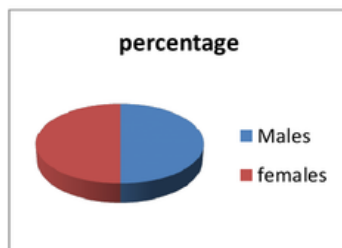


*Figure1: data presentation table of the responses:*

| <i>Responses</i> | <i>Q1</i> | <i>Q2</i> | <i>Q3</i> |
|------------------|-----------|-----------|-----------|
| <i>1response</i> | 6         | 2         | 4         |
| <i>2response</i> | 4         | 1         | 3         |
| <i>3response</i> | 1         | 5         | 4         |

- **Conclusions and Recommendations:**

To outline the entire work in this chapter, it would be recommended way to go with divining the sections of the works and make an explanation to each of it. However, this part need to clarify the sections and what has been done in each by explaining the figures and go through the whole thing in details , as well as showing the result that come out.

- **What recommendations might you be able to make to researchers?**

The recommendations that will be based upon the statistical analysis result that we will get from the survey. Moreover, what should governments do to make improvement in energy reduction, on the other hand, the individual behaviours and how that plays roles in the community.

## ❖ The survey Questions

This survey aims to examine how much people aware and taking care about the usage of their home energy. However, the target people in this phase are the one who already has the responsibility of paying the home bill if not, a person who lives with family member. Survey can be a good way to make people aware of their energy uses because they personally can tell the responses and therefore, they can assume from their responses how much they look after their energy use.

### 1. What is your age?

- 1) Between 18 to 24.
- 2) 25 to 34.
- 3) 35 to 44.
- 4) 45 and over.

### 2. What is your gender?

- 1) Female
- 2) Male

### 3. Do you live in?

- 1) In the UK
- 2) In the USA
- 3) Middle East
- 4) Somewhere else

**4. Do you have children in your home?**

- 1) Yes I do
- 2) No, I don't.

**5. Select your living situation**

- 1) Shared house or flat
- 2) Rent or own self-contained accommodation
- 3) Halls or residence
- 4) Live with parents or carers
- 5) Other (please state)

**6. How many people live in your household?**

- 1) 1 to 3 people
- 2) 3 to 5 people
- 3) 6 to 9 people
- 4) More than 10

**7. Do you aim to save/reduce energy use?**

- 1) Yes I do
- 2) No I don't
- 3) Don't know

**8. How many home devices/appliances (such as, TV, Oven, Microwave, fridge, etc.) do you have?**

- 1) Less than 5
- 2) Between 5 To 10
- 3) Between 11 to 16
- 4) Between 17 to 22
- 5) Between 23 to 27
- 6) ) More than 27

**9. How likely do you use alternative ways to reduce energy usage, Such as using hand machines instead of electricity one?**

- 1) I always do
- 2) Sometimes
- 3) Never

**10. Do you turn the light off while you're sleeping/ leaving the room?**

- 1) Yes I always turn the light off.
- 2) Sometimes.
- 3) I never do that.

**11. As we all know energy is a good beneficial thing for us, do you believe that energy has an impact on people in a bad way?**

- 1) Yes, I do.
- 2) No, I don't.
- 3) I don't know.

**12. Have you think before of a way to reduce the bill cost of your house?**

- 1) Yes I have

2) No I have not

3) I don't care that much about it.

13. How big is the difference in your energy bill costs between different months?

1) Very big.

2) Almost the same.

3) I don't know.

14. What kind of payment method do you use to pay you bill?

1) The bill included in the rent

2) Transfer the amount

3) By check

4) Other method.

## CHAPTER 4

### ➤ Introduction:

This chapter is going to present and analysis the response of the survey for the home energy usage survey. This survey has been responded by different type of people, different age group, from people who lives in or outside the UK and also from both gender. The survey designed by **SurveyMonkey** and the data have been collected from multiple sources such as, Face book and forwarded to some of my family members, classmates and my lecturer's colleagues. The survey aims to find out about the behaviour of occupancy, households properties in their energy consumption. As well as, how can the occupants from different ages group and cultures behave with energy consumption, besides what are the attitude behind their behaviours whether they tend to care for how much their energy usage or not. In the other side, I will illustrate my home energy usage by monitor called **Watts Clever**. Basically, this is a device to display the home energy.

By **Watts Clever** monitor I will record my home energy usage for the first week and find out how much energy usage I used. In the other hand, for the second week I will start watching my energy usage and see if there is any difference between the two weeks and how big is that.

### • Results and Evaluation:

The main aim of this survey is to discover and collect some data about certain number of households; in this survey 52 of data have been covered about home energy usage by residents in different ages and backgrounds. By questionnaire people we can get the fact about behaviours and conditions of people.

### • Survey analysis:

First of all, the sampling method have been selected to be used in here is the **random sampling**. However, the reason why this method has chosen is because the hypothesis question aims to test group of people in how they behave and how much they care about home energy usage and the consequences of it on the environmental aspect.

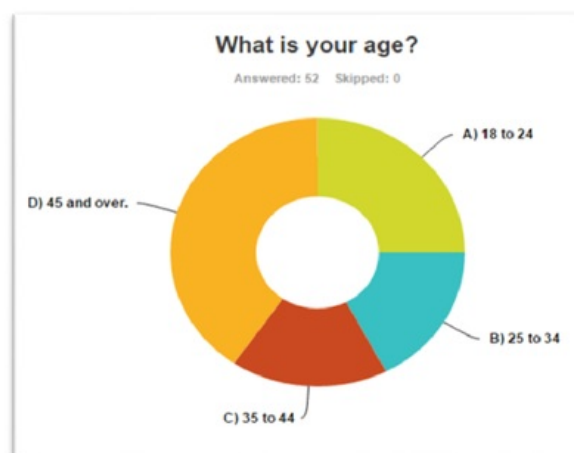
**In this survey the responses regarded by 52 of people:**

➤ The First, Second and Third question were about the (age, gender and the living country) the following demonstrate the result of the questions:

### • Question 1+2+3:

○ **Figure1: Q1:**

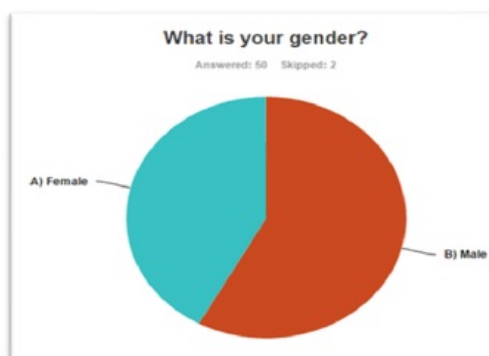
| Answer Choices  | Responses    |
|-----------------|--------------|
| A) 18 to 24     | 25.00%<br>13 |
| B) 25 to 34     | 17.31%<br>9  |
| C) 35 to 44     | 17.31%<br>9  |
| D) 45 and over. | 40.38%<br>21 |
| <b>Total</b>    | <b>52</b>    |



Q1, According to the Pie Chart most of the responses came from mature people who are in age 45 and over by 40.38% which means 21 persons out of 52. Beside that people in age group from 18 to 25 were 25%. While the other two age groups 25 to 34, and 35 to 44 came to be the least and have got the equal percentage of replies and it was 17.31%.

○ *Figure2: Q2:*

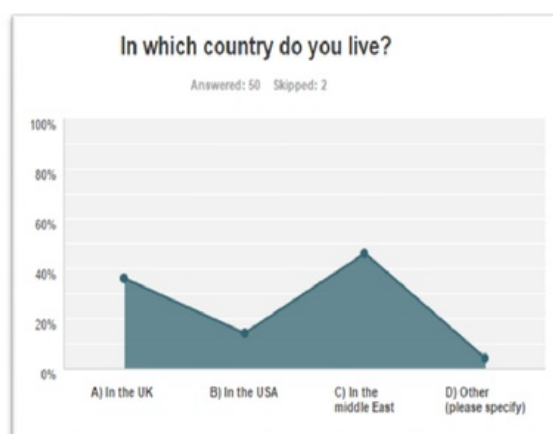
| Answer Choices | Responses    |
|----------------|--------------|
| B)Male         | 58.00%<br>29 |
| A)Female       | 42.00%<br>21 |
| Total          | 50           |



Q2+3, On the other hand, the survey result has showed that males are higher by 58% and females 42%. As result of the living place question, 46 per cent has elected (In the Middle East) as the living place which means 23 out of 50 and two of the responses specified the country to be Saudi Arabia. From 50 replies we have 36 % (18) of people who lives in the UK and 14% in United States.

○ *Figure3: Q3:*

| Answer Choices            | Responses    |
|---------------------------|--------------|
| A) In the UK              | 36.00%<br>18 |
| B) In the USA             | 14.00%<br>7  |
| C) In the middle East     | 46.00%<br>23 |
| D) Other (please specify) | 4.00%<br>2   |
| Total                     | 50           |



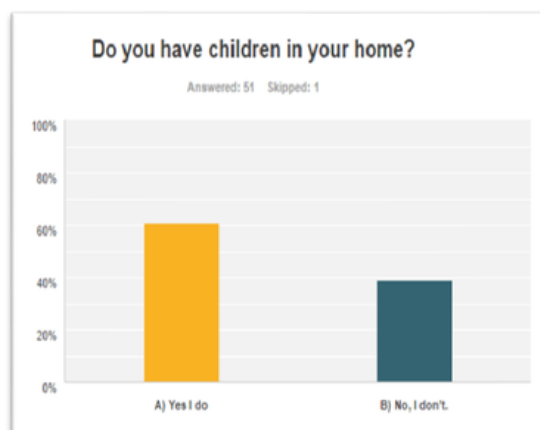
➤ **Question number 4 and 5 were about if there any kids in home and living situation:**

○ **Questions 4 + 5:**

Q4, The rate of quesation 4 was higher for people who live in home and having children by 60.78% while the other part who do not have kids were lower and the precentage was 39.22%. Appearnatly families who have childeren in home will expenditure more energy than others who do not have kids. The overall, people who answered this one was 51 out of 52.

○ **Figure4: Q4:**

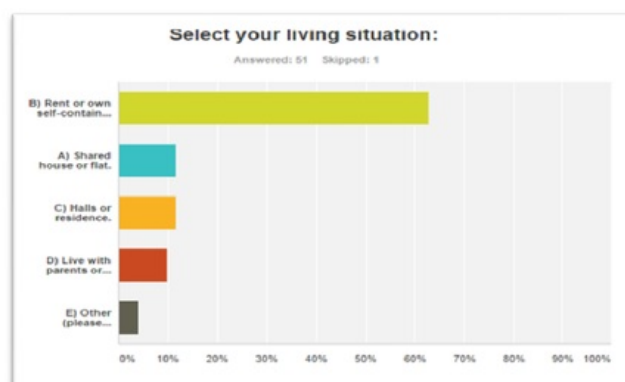
| Answer Choices  | Responses   |
|-----------------|-------------|
| A) Yes I do     | 31= 60.78%  |
| B) No, I don't. | 20 = 39.22% |
| <b>Total</b>    | <b>51</b>   |



In Question 5: people who have selected the choice (B) *Rent or own self-contained accommodation* as living situation was higher by 62.75%. On the other hand, two of the responses have specified that they live in Villa, and the rest of the percentage was divided between *Shard house or flat* and *Halls or residence* both were equal by 11.76%. The last choice for people who live with parents or carers got 9.80%.

○ *Figure5: Q5:*

| Answer Choices                                      | Responses                  |
|-----------------------------------------------------|----------------------------|
| <b>B) Rent or own self-contained accommodation.</b> | <b>62.75%</b><br><b>32</b> |
| <b>A) Shared house or flat.</b>                     | <b>11.76%</b><br><b>6</b>  |
| <b>C) Halls or residence.</b>                       | <b>11.76%</b><br><b>6</b>  |
| <b>D) Live with parents or carers</b>               | <b>9.80%</b><br><b>5</b>   |
| <b>E) Other (please specify)</b>                    | <b>3.92%</b><br><b>2</b>   |
| <b>Total</b>                                        | <b>51</b>                  |

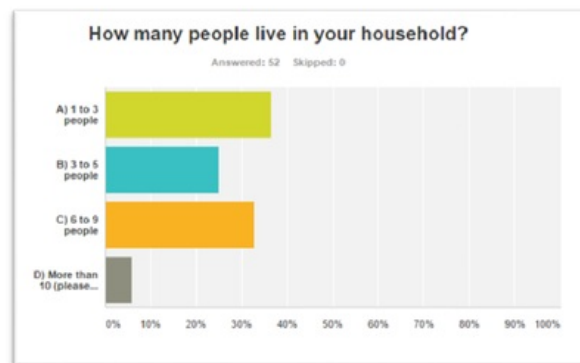


➤ **Quesation 6 and 7 were about the family size and the number of people that living in tne home, and how much the family tend to reduce energy:**

Q6, Considering the different range of age and the backgrounds, in this question however, the answerers are vary between higher and lower number of people who live in one house, as it shows in the picture there are two similar result and two differs. A and C have got similar rate of percentage, (A) 1to 3 people has got the biggest rate out of all by 36.54% (19) while, (c)6 to 9 people consider to be quite big family got 32.69% (17). Also the case (D) more than 10 was 5.77% (3) and lastly 25% for (B) 3 to 5 people.

○ **Figure6: Q6:**

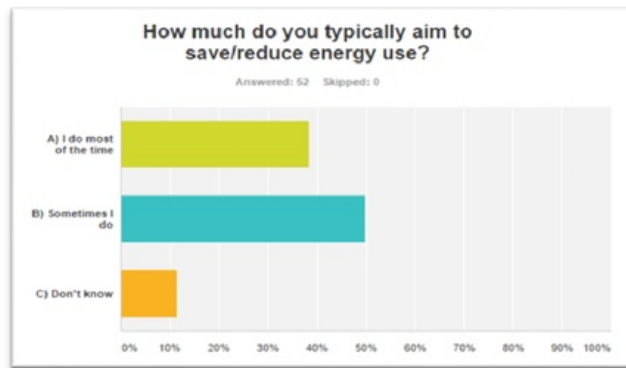
| Answer Choices                   | Responses    |
|----------------------------------|--------------|
| A) 1 to 3 people                 | 36.54%<br>19 |
| B) 3 to 5 people                 | 25.00%<br>13 |
| C) 6 to 9 people                 | 32.69%<br>17 |
| D) More than 10 (please specify) | 5.77%<br>3   |
| Total                            | 52           |



Q7, the result showed the percentage of people who mostly aim to save and reduce their energy was 38.46%. Whereas the percentage of other who don't know if they save and reduce of their energy use by 11.54%. However, the highest rate have been to (B) by 50%. The variety between (A and b) and (C) were notable which they mostly appreciate energy benefits and also the risk of over use.

○ Figure7: Q7:

| Answer Choices           | Responses    |
|--------------------------|--------------|
| A) I do most of the time | 38.46%<br>20 |
| B) Sometimes I do        | 50.00%<br>26 |
| C) Don't know            | 11.54%<br>6  |
| <b>Total</b>             | <b>52</b>    |

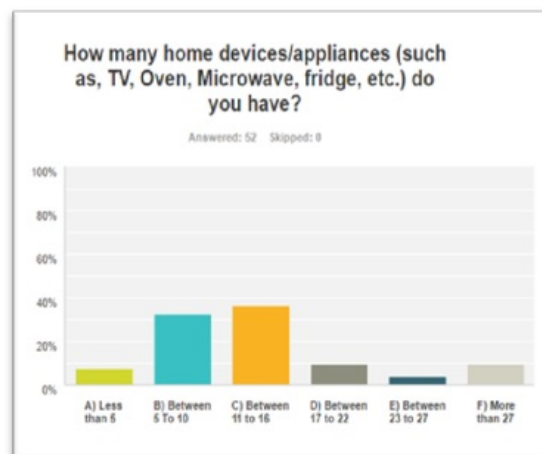


➤ In questions 8 and 9, they were about the home appliances numbers and if there tend to use the

Q8, The number of appliances for more than 27 has got the rate of 9.62% while the one for less than 5 has the percentage of 7.69%. The percentage quite similar but the number of devices for each is diver. However, the highest percentage has been for (C) 11 to 16 appliances by 36.54% which is fairly number. The lowest parentage is 3.85% to (23 to 27 appliances).

○ Figure8: Q8:

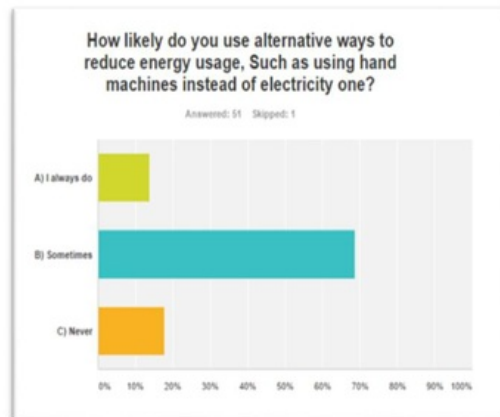
| Answer Choices      | Responses    |
|---------------------|--------------|
| A) Less than 5      | 7.69%<br>4   |
| B) Between 5 To 10  | 32.69%<br>17 |
| C) Between 11 to 16 | 36.54%<br>19 |
| D) Between 17 to 22 | 9.62%<br>5   |
| E) Between 23 to 27 | 3.85%<br>2   |
| F) More than 27     | 9.62%<br>5   |
| <b>Total</b>        | <b>52</b>    |



Q9, as technologies growing day by day 17.65 of people who said they never use alternative ways to reduce energy whereas, 13.73% they always using alternative ways such as using hand appliances not electric one. 68.63% of them don't mind both of ways.

○ *Figure9: Q9:*

| Answer Choices | Responses    |
|----------------|--------------|
| A) I always do | 13.73%<br>7  |
| B) Sometimes   | 68.63%<br>35 |
| C) Never       | 17.65%<br>9  |
| Total          | 51           |

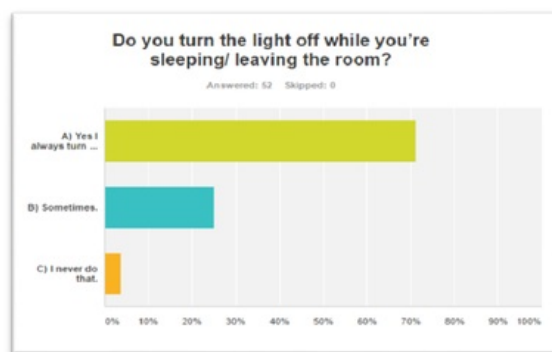


➤ In Question 10 and 11 were about the home residents and turning the lights off when they leaving the room/home, and

Q10, This graph shows that most of the people who answered this question selected the answer (A) by 71.15%. 37 out of 52 have chosen to turn the lights off when they leaving the place which explains that they give an attention to either for saving money or the impact of high energy use. However, the rate of people who has chosen to choice (C) was the lowest by 3.85% which a positive sign. 25% of the replies for (B) which is sometimes, they turn the lights off.

○ Figure10: Q10

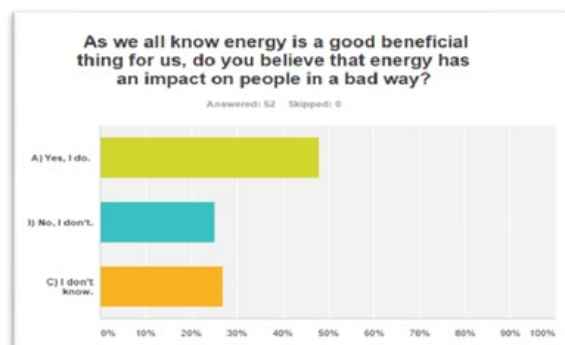
| Answer Choices                      | Responses    |
|-------------------------------------|--------------|
| C) I never do that.                 | 3.85%<br>2   |
| B) Sometimes.                       | 25.00%<br>13 |
| A) Yes I always turn the light off. | 71.15%<br>37 |
| Total                               | 52           |



Q11, impressively, 48.08% of people who chosen (A), which they aware of the benefits and other impacts side of energy. 25% of them don't believe that energy has an influence on us and 26% given to (C) I don't know.

○ Figure11: Q11:

| Answer Choices   | Responses    |
|------------------|--------------|
| A) Yes, I do.    | 48.08%<br>25 |
| B) No, I don't.  | 25.00%<br>13 |
| C) I don't know. | 26.92%<br>14 |
| Total            | 52           |

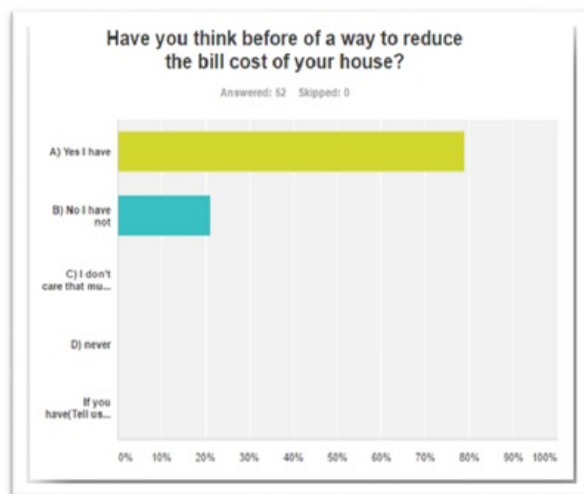


➤ Last three questions 12, 13 and 14 were about the

Q12, 78.85% of the responses for A that means more than a half of the replies tried to think in such a way to reduce the cost of their home bill or at least they more concern about energy saving. However, 21.15% of them did not think of any ways to cut the cost bill.

• figure12: Q12

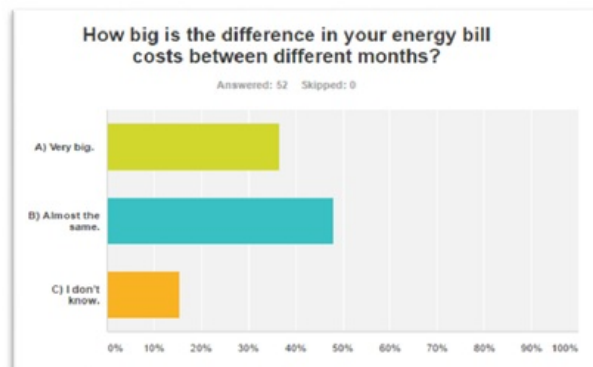
| Answer Choices                                   | Responses    |
|--------------------------------------------------|--------------|
| A) Yes I have                                    | 78.85%<br>41 |
| B) No I have not                                 | 21.15%<br>11 |
| C) I don't care that much about reducing energy. | 0.00%<br>0   |
| D) never                                         | 0.00%<br>0   |
| If you have(Tell us about it)                    | 0.00%<br>0   |
| Total                                            | 52           |



Q13, The result for this question are vary between the choices, 48.08% of the responses have selected Almost the same between the months. While 36.54% chosen Very big between the months and 15.38% of them didn't know about their energy bill between the months. It is reasonably to have a higher percentage of residences that agree to have almost the same bill monthly which means they pretty much have stable lifestyle.

• *Figure13: Q13:*

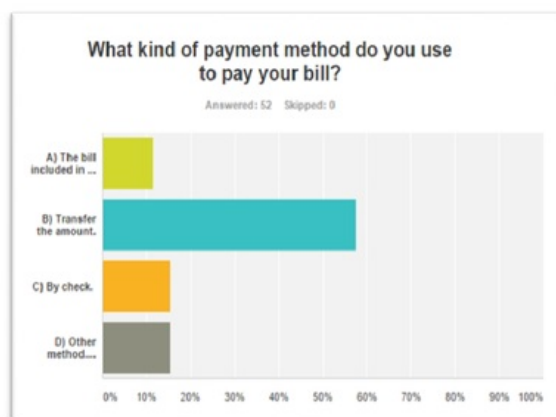
| Answer Choices      | Responses    |
|---------------------|--------------|
| A) Very big.        | 36.54%<br>19 |
| B) Almost the same. | 48.08%<br>25 |
| C) I don't know.    | 15.38%<br>8  |
| <b>Total</b>        | <b>52</b>    |



Q14, In the last one the payment method that most people have elected is to use the Transfer the amount by 57.69 per cent. 11.54 of them living in place included with the energy bill. Where 15.38 using to pay by check.

• *Figure 14: Q14:*

| Answer Choices                    | Responses    |
|-----------------------------------|--------------|
| A) The bill included in the rent. | 11.54%<br>6  |
| B) Transfer the amount.           | 57.69%<br>30 |
| C) By check.                      | 15.38%<br>8  |
| D) Other method. (please specify) | 15.38%<br>8  |
| <b>Total</b>                      | <b>52</b>    |



The outcome indicated is that 52 of people who have taken part in this survey appear like to fluctuate in ages, background's culture, living place and status. However, as expected one of the problem in households was that people who live in bigger houses cannot be comparable to those who live in student Halls or residence or small flats, in terms of many area such as, the needs of energy, appliances, lightening, and air conditioner/ heating. Generally, some small behaviours would defiantly influence in reducing or raising energy use in our life. The age generation also would influence on energy. Remarkably 41 of people said that they care about reducing energy while 11 of them said did not care about energy. And this illuminate that number of people who already realizable about saving energy and environmental properties In order to seek the aims of energy emissions reduction the concerns should not to be on the side of resident behaviour or energy efficiency. More importantly, we have to be aware that households are miscellaneous and thus the strategy of reducing carbon emissions that can be working well for one residence might not be good for another. (44)[**Scott Kelly, 2013**] To understand the relation between the human behaviours and the physical changing of buildings they dwell in, however, by solving the complicated relationship that effect on energy use and getting a visible idea where energy and emissions saving should be made. This complicated interactions of variables that occur in the houses standard that eventually represents the ideal solution to mitigate carbon emissions. Therefore the need of policy instruments to reflect the variety in the building stock thus reduce emissions can expand through the building stock.

At times to be effective by changing behaviours by dealing not only on the behaviours side but also by working on the conditions of environment and social, that drive to this behaviours in the community context where people live their daily routine. (45)[**The British Psychological Society, 2014**] besides, it should understand the influence of the conditions that lead to build up these behaviours in the social that can make the priority to be equal for policy producer and focus more on the actions itself.

### Tips for lower cost bill, and energy reduction in domestic:

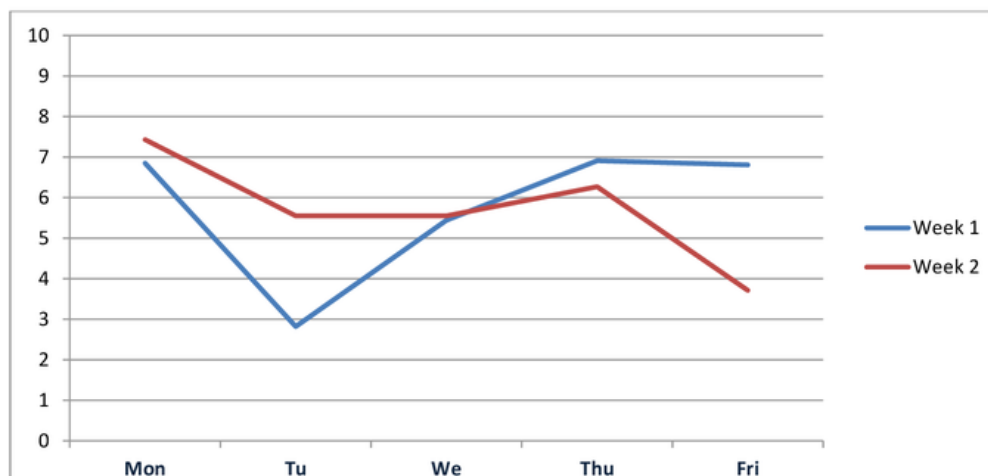
- ❖ Cavity wall isolation: this method can save energy for users over to £270 in the year; however, the average savings can be around £120. The costs could be low up to £150, or can be free for people who reservations. (45)[Scott Byrom, 2016]
- ❖ Electronics plugs like, TV and other devices turn the power off while it is not in use. Which they still take power in the standby mode. This could save you around £30 yearly. (46)
- ❖ Saving around £30 yearly in energy bill by using kitchen equipment accurately, such as, using the bowl instead of a tap in washing.
- ❖ A water efficient shower head: the family that contains 4 people, will save nearly £80 in the year by using it on gas for heat water, besides that £120 for water bills when you have a water meter.

### ➤ My home experiment:

Daily amount of energy that households required or each institution seek to meet the total of their energy needs. For Example: daily energy demand for a normal European domestic is roughly 45 kWh includes request from fridge, and 20 electric lamps, a television, a clothes dryer, a washing machine, a dishwasher and other domestic appliances. Typical energy needs for normal East African household in the countryside is on the demand of minimal 2 kWh which includes foremost heat energy for cooking.(43)[altenergy]

Our Family Lifestyle: My household composed of two, one adult and a boy 1-year old. Although we are only two, our flat is packed of electric consuming appliances – from large HD TVs, smartphones and toothbrush that need to recharge, microwaves and other kitchen devices etc

○ *Figure1: Two weeks of my home energy calculator:*



|               | Mon      | Tue      | We       | Thu      | Fri      |
|---------------|----------|----------|----------|----------|----------|
| <b>Week 1</b> | 6.84/kwh | 2.82/kwh | 5.44/kwh | 6.91/kwh | 6.90/kwh |
| <b>Week 2</b> | 7.43/kwh | 5.55/kwh | 5.55/kwh | 6.27/kwh | 3.71kwh  |

This line graph shows how much energy I have used during two weeks. By home energy monitor I have recorded the daily use for making a comparison between the two. However, in the first week the data has just been collected from the monitor. Following that, in the second week as much as possible to look after the total energy we spend and avoiding any wastage in the use.

The first week was pretty much changing especially between Monday and Tuesday, where the figure has dropped sharply from 6.84kwh to 2.82kwh. In contrast, in the beginning of the second week, the first day was the highest out of all days, nonetheless the peak went down and being stable for the rest two days. However, on Wednesday and in both weeks the peak was almost to meet which the point was very close (5.44kwh and 5.55kwh). The overall of our home energy usage is steady as the habits of our daily routine pretty much organised for instance, the bath time and cooking time.

## CHAPTER 4

### ➤ Conclusion:

This work of research was looking in the wide area of people behaviours in how to use energy and encourage energy reduction through social sites. In conclude, around 52 of collected outlook by the survey between technology users, concerning the information about climate change and other side effects of energy, and some related home behaviours. Enhancing behaviours change not possible to think only about users' rationality options. Mainly due by means of money of indirectly advantages to the environment. However, the consumers should feel desire to assess between the options of more eco-friendly and personal values. However, we can say technology is a path to assist to this approach. In the meantime, social media sites can be one of the most fundamental ways to help in changing people behaviours. But more importantly, this way can be effective alongside with others aspects. In the literature review, has highlighted some studies about high electricity usage in some countries and its effect in there, and how these countries trying to solve these issues.

### ➤ Recommendation:

#### ➤ The government strategy:

The governments should take a strategic role, and ensure to the suitable long-term directing and financial structure is in position in order to authorize the market to provide as much as needed in the field of the renewable energy. Some suggestion to provide the revolution of renewable energy the following will be needed: **(37)[HM Government, 2009]**

Support a new technologies and resources, to aid the reduction of carbon emissions. The new sources of energy renewable supply would reduce the high costs of energy consumption and extend and support the supplies principle in the country. However, most countries around the world can get benefits of natural resources. Government should always analyse all potential sources of supplies, and immediately take advantage of those that can transfer energy reasonably, by secure and sustainable ways.

Also every household has the opportunity to benefit of renewable energy, when the government help and provide them the opportunity. Governments can create a new strategy by supporting finance of communities and businesses and developing advice and ensure powerful industries and also producing less emission.

- Actually one of the main points for reducing domestic energy consumption can be through focusing on how to change behaviour for residents. In order to make people more aware of how energy reduction can affect the environment and then our life. One effective way can be made by governments in corroborating with electrical companies is to state each household of their energy need according to the family size and how much they need to cut and reduce their usage of energy.
- Nowadays, consider how people lifestyle is completely related to social media whether younger or older generations, through social media sites energy companies should join these social media revaluation and update the consumers by their latest energy data. This way can be more effective to encourage consumers and increase the awareness of energy usage at homes. According to a BCSS, the initial condition to increase the level of awareness is that to provide a feedback for the individual's act. (42)[ **Lara S. G. Piccolo, Harith Alani, 2015**] Good technology creation should furthermore encourage people to be involved, such as, toward people to be connected on behalf of savings.
- Engaging people in any the program since the beginning, they will recognize and feel they are part of it, and then sense of property, and that will help in forming the real goals, to get the feeling of accomplishment and promote their competencies, and develop their skills in this area.
- Efficiency growth comes from both technology change and behaviour.(39)[ **Sullivan, M. and Sullivan, F**]

## References

1. Jaina L. Moan and Zachary A. Smith (2007). *Energy Use Worldwide*. United States: Santa Barbara. 1.
2. Guy C. Brown (1999). *The Energy of Life: The Science of what Makes Our Minds and Bodies Work*. UK: Harper Collins. 2.
3. David C. Cassidy, Gerald Holton, F. James Rutherford (2002). *Understanding Physics*. USA: Springer-Verlag New York, Inc. 235.
4. Stephen Butz (2015). *Energy and Agriculture: Science, Environment, and Solutions*. United States: Cengage Learning. 199.
5. Youn Chen, Nordic Council of Ministers (2004). *Promotion of renewable Energy globally* . Denmark : Nordic council . 9.
6. Henrik Lund (2010). *Renewable Energy Systems: A Smart Energy Systems Approach to the Choice and modelling of 100%renewable solution* . USA, Uk: Academic press is an imprint of Elsevir. 8.
7. Klaus Rennings, Bettina Brohmann, Julia Nentwich, Joachim Schleich, Thure Traber, Rolf Wüstenhagen (2013). *Sustainable Energy Consumption in Residential Buildings*. New York: Springer Heidelb. 4.
8. Jaina L. Moan, Zachary Alden Smith (2007). *Energy Use Worldwide: A Reference Handbook*. United States: ABC-CLIO, Inc.21.
9. United Nations. Economic Commission for Europe (2007). *Environmental Indicators and Indicator-based Assessment Reports: Eastern Europe, Caucasus and Central Asia..* New York and Geneva: UNECE Working Group. 42.
10. Olivia Guerra Santin (2010). *Actual Energy Consumption in Dwellings: The Effect of Energy Performance regulation and occupant behaviour*. Amsterdam: IOS Press. 6.

11. Saha, Sohag Kumar; Habiba, Ummay. (2013). The Analysis of Solar Energy System to Eliminate the Existing Load-Shedding Problem in Bangladesh. *American Academic & Scholarly Research Journal*,. 5 (5), 1.
12. G. N. Tiwari, Rajeev Kumar Mishra (2011). *Advanced Renewable Energy Sources*. : Royal Society of Chemistry. 458.
13. Ralph Zito (2011). *Energy Storage: A New Approach*. Canada: John Wiley & Sons, Inc. . 8, 9.
14. John R. Fanchi (2004). *Energy: Technology and Directions for the Future*. United States: Academic Press. 3,4.
15. Halime Ö. Paksoy (2007). *Thermal Energy Storage for Sustainable Energy Consumption: Fundamentals, Case Studies and Design*. Turkey: Springer. 87.
16. David Coley (2011). *Energy and Climate Change: Creating a Sustainable Future*. UK: John Wiley & Sons, 4.
17. David G. Victor (2004). *Climate Change: Debating America's Policy Options*#. United States: Council on Foreign Relations. V.
18. Joel B. Smith, Robert O. Mendelsohn (2007). *The Impact of Climate Change on Regional Systems: A Comprehensive Analysis of California*. USA, UK: Edward Elgar Publishing. 212.
19. Almas Heshmati, Shahrouz Abolhosseini, Jörn Altmann. (2015). Summary and Conclusion. *The Development of Renewable Energy Sources and its Significance for the Environment* . London: Springer. 147.
20. Anne E. Maczulak (2009). *Renewable Energy: Sources and Methods*. United States: InfoBase Publishing. Xiii.
21. Katrin Jordan-Korte (2011). *Government Promotion of Renewable Energy Technologies: Policy Approaches and Market Development in Germany, the United States, and Japan*. Germany: Springer Science & Business Media. 11.

22. Emily Gosden. (2015). *Renewable electricity overtakes coal for first time in UK*. Available:  
<http://www.telegraph.co.uk/news/earth/energy/windpower/11889329/renewable-energy-overtakes-coal-statistics.html>. Last accessed 12/03/2016.
23. Coalition Government. (2010). *the National Renewable Energy Action Plan for the United Kingdom*. Available:  
[http://www.gshp.org.uk/UK\\_Renewable\\_Energy\\_Policy.html](http://www.gshp.org.uk/UK_Renewable_Energy_Policy.html) .[ Last accessed 17 March 2016].
24. Saudi Gazette. (2015). *Saudi Arabia stresses need for renewable energy*. Available:  
<http://english.alarabiya.net/en/business/energy/2015/12/10/Saudi-Arabia-stresses-need-for-renewable-energy.html> .[Last accessed 24 March 2016].
25. Reuters. (2012). *Renewable energy in Saudi Arabia*. Available:  
<http://www.nortonrosefulbright.com/knowledge/publications/61454/renewable-energy-in-saudi-arabia> . [Last accessed 24 March 2016].
26. Joanna Lewis. (2011). *Energy and Climate Goals of China's 12th Five-Year Plan*. Available: <http://www.c2es.org/international/key-country-policies/china/energy-climate-goals-twelfth-five-year-plan> . [Last accessed 27 March 2016]
27. Roger Fouquet (2013). *Handbook on Energy and Climate Change*. UK: Edward Elgar Publishing. 666
28. Great Britain: Parliament: House of Commons: Energy and Climate Change Committee (2012). *Low-Carbon Growth Links With China*. UK: The Stationery Office. 6.
29. Victoria Goodright, Emily Wilkes. (2015). *Energy Consumption in the UK (2015)*. Available:  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/449134/ECUK\\_Chapter\\_3\\_-\\_Domestic\\_factsheet.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/449134/ECUK_Chapter_3_-_Domestic_factsheet.pdf) . [Last accessed 30 March 2016].

30. Volker Quaschnig (2005). *Understanding Renewable Energy Systems*. the UK and USA: Earthscan. 8.
31. Zachary Shahan (2013). *Advantages & Disadvantages of Solar Power*. Available: <http://cleantechnica.com/2013/10/08/advantages-disadvantages-solar-power/> . [Last accessed 7 April 2016].
32. Daniel H(2013). *Advantages and Disadvantages of Solar Panels*. Available: <http://www.hope-project.org/energy/advantages-and-disadvantages-of-solar-panels/> .[ Last accessed 8 April 2016].
33. James Bratley. (2013). *Disadvantages of Solar Energy*. Available: <http://www.clean-energy-ideas.com/solar/solar-energy/disadvantages-of-solar-energy> .[Last accessed 7 April 2016].
34. Ellen Christoforatu (2012). *Teaching Right Livelihood. Eine Handreichung für Lehrkräfte und Lehrerbildner. Mit englischsprachigen Unterrichtsmaterialien*. Germany: kassel university press GmbH. 161.
35. Eckart Woertz. (2013). *the domestic challenges in the Saudi energy market and their regional and geopolitical implications*. Available: <https://www.ciaonet.org/attachments/24183/uploads>. [ Last accessed 11 April 2016].
36. Volker Quaschnig (2005). *Understanding Renewable Energy Systems*. Uk and USA: Earthscan . 27
37. HM Government (2009). *the UK Renewable Energy Strategy*. UK: Crown. 10.
38. Axon, C., S. Bright, T. Dixon, K. Janda, and M. Kolokotroni. "Building communities: Reducing energy use in tenanted commercial property." *Building Research and Information*, 2012, Vol. 40, No. 4, pp. 461-472.
39. Sullivan, M. and Sullivan, F. "Using experiments to foster innovation and improve the effectiveness of energy efficiency programs." CIEE Report, 2009.
40. Scott Kelly. (2013). *Energy efficiency and human behaviour*. Available: <http://www.cam.ac.uk/research/discussion/energy-efficiency-and-human-behaviour>. [Last accessed 14 April 2016].

41. Karel Beckman (2015). *How to use social media: a quick guide for utility companies*. Available: <http://www.energypost.eu/energy-companies-can-learn-social-media/>. [Last accessed 19 April 2016].
42. Lara S. G. Piccolo, Harith Alani (2015). *Perceptions and behaviour towards climate change and energy savings*. Uk : EnviroInfo . 108.
43. altenergy *Users Guide to off Grid Energy Solutions*. Available: <http://www.altenergy.org/Glossary/enerpage.html> . [Last accessed 5 April 2016].
44. The British Psychological Society. (2014). *Behaviour Change: Energy Conservation*. Available: <http://www.bps.org.uk/system/files/Public%20files/energy.pdf>. [Last accessed 16 April 2016].
45. Scott Byrom. (2016). *How to reduce your electricity and gas usage*. Available: <https://www.ukpower.co.uk/energy-saving-advice>. [Last accessed 20 april 2016].
46. (2014). *Energy saving quick wins*. Available: <http://www.energysavingtrust.org.uk/domestic/energy-saving-quick-wins>. [Last accessed 20 April 2016].