FACTORS INFLUENCING MALAYSIAN CONSUMERS' PURCHASE INTENTION ON ENVIROMENTAL FRIENDLY LIGHTING PRODUCTS IN MALAYSIA

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LIST OF ABBREVIATIONS

ATT	Attitude
CFA	Confirmatory Factor Analysis
CA	Consumer attitude
CSR	Perceived Corporate Social Responsibility
DBKL	Kuala Lumpur City Hall
Df	Degree of Freedom
DOE	Department of energy
DV	Dependent Variable
EA	Environmental Attitude
EC	Environmental Concern
EK	Consumer's Environmental Knowledge
EL	Eco Label
EPU	The Economic Planning Unit
GI	Government initiative
H	Hypothesis
IV	Independent Variable
LED	Light Emitting Diode
IgCC	International Green Construction Code
P	Price
PI	Purchase Intention
PP	Peer Pressure
PLS	Partial Least Square
PLS-SEM	Partial Least Square-Structural Equation Modelling
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UNEP	United Nations Environment Programmes
S	Self-identity
SI	Social Influence
SPSS	Statistical Package for the Social Sciences
UOA	Unit of Analysis
WTP	Willingness to Purchase

B	Beta
α	Cronbach’s Alpha

ABSTRAK (MALAY)

Kajian ini dijalankan dengan menunjukkan penyesuaian Teori Tingkah Laku Terancang (TPB), untuk mengkaji faktor-faktor yang mempengaruhi niat pembelian pengguna Malaysia terhadap produk lampu mesra alam (LED) dan bagaimana niat pembelian mempengaruhi kesanggupan mereka berbelanja untuk produk lampu ini. Soal selidik tadbir sendiri telah direka dengan menggunakan skala yang ditetapkan. Seramai 224 responden dari seluruh Malaysia terlibat dalam kajian ini. Analisis data dibuat dengan menggunakan perisian *Statistical Package for the Social Sciences* (SPSS) dan *Partial Least Square* (PLS). Hasil kajian didapati daripada analisis menunjukkan sikap terhadap tanggungjawab social korporat adalah faktor penting yang mempengaruhi keinginan pembelian pengguna, seterusnya diikuti dengan inisiatif kerajaan, sikap terhadap alam sekitar, sikap kebimbangan terhadap alam sekitar dan persepsi identiti diri. Sebaliknya, tekanan daripada kawan dan pengetahuan tentang alam sekitar didapati tidak mempunyai pertalian secara signifikan dengan niat pembelian. Penyelidikan ini memberi pemahaman yang mendalam tentang niat pembelian pengguna Malaysia terhadap produk lampu mesra alam.

Hasil kajian ini boleh digunakan untuk merangka dan membentuk strategi pemasaran bagi pengedar produk lampu mesra alam , syarikat-syarikat pembuatan lampu mesra alam dengan memenuhi keperluan dan kemahuan suatu kumpulan pembeli. Selain itu, pembuat dasar dan badan-badan kerajaan yang memain peranan yang penting dalam menjejas permintaan penguna dapat meningkatkan pembelian produk lampu mesra alam serta meningkatkan ekonomi negara.

ABSTRACT

This study demonstrates the adaptation of Theory of Planned Behaviour (TPB) to examine the factors influencing Malaysian consumers' purchase intention towards environmental friendly lighting products (LED) and how purchase intention affects their willingness to pay for the related lighting products. A self-administered questionnaire was designed using established scales. A survey of 224 respondents was conducted in Malaysia. Statistical Package for the Social Sciences (SPSS) and Partial Least Square (PLS) were used to examine data analysis. Perceived corporate social responsibility was discovered to be the most significant predictor of consumers' purchase intention in environmental lighting products followed by government initiative, environmental attitude, environmental concern and self- identity. Environmental knowledge and peer pressure were found to have an insignificant influence on consumers' purchase intention on environmental friendly lighting products in Malaysia. Consumers' purchase intention on environmental friendly lighting products has been demonstrated to have a positive relationship with consumers' willingness to purchase for environmental friendly lighting products.

The research provides an in-depth understanding of Malaysian consumers' purchase intention towards environmental friendly lighting products. The research findings can be used to formulate strategies for the distributor, marketer and manufacturer companies to create a good positioning strategy to enhance consumer perception on environmental friendly lighting products and meet the consumers' needs and wants. Also, policy maker and governmental bodies which play an important roles on influencing consumers' purchase intention, by enforce legislation

and improve on promoting environmental friendly lighting products able to enhance the purchase of environmental friendly lighting products and to accelerate Malaysia economic.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter provides an outline about the study of the factors influencing consumers' purchase intention towards environmental friendly lighting products in Malaysia. This chapter will be arrange with background of study followed by a discussion on the problem statements, research objectives, research questions, definition of major key terms and significant of study. Toward the end of this section, organizational of the study will be discussed.

1.2 Background

1.2.1 Solid-state Lighting issues

Environmental issue is not a new issue in our society. Awareness on environmental performance is considered as one of the social responsible. With the increase of the electricity consumption, population, and unstable of fuel cost, many countries have implemented the environmental friendly lighting products which not only create a good impact to environment, but also a partial solution to energy consumption. Malaysia government impresses sustainability development as Malaysia initiative in 11th Malaysia's plan (2016 - 2020) (EPU, 2010). According to International Energy Agency (2013), energy efficiency initiative in Malaysia expected to achieve MYR 2.3 billion (USD 722 million) of total public expenditure from 2011 to 2020, leveraging MYR 12.1

billion (USD 3.8 billion) in private sector investment, and leading to energy cost savings of MYR 52 billion (USD 16.3 billion).

With the direct effect on global climatic change, the important of enhancing the efficiency of residential lighting cannot be overemphasized. Malaysia's Prime Minister had listed a target at the United Nations Framework on climate change convention in Denmark which had showed Malaysia's commitment towards greener energy on reducing Malaysia CO2 emissions intensity per unit GDP about 40 % by 2020 against a 2005 baseline (Khor & Lalchand, 2014). Considering only of households sectors in switching the lighting products from incandescent lamps to Compact Fluorescent Lamps (CFL) and LEDs in Malaysia, electricity consumption and CO2 emission possible to reduce by 10.69% by 2020 (Hasti *et.al.,* 2015).

1.3 Overview of Solid-state Lighting (SSL)

Light emitting diodes are semiconductor devices that emit light. The light emitting diode (LED) alternative known as solid-state lighting (SSL). Various researches and studies suggested that environmental friendly lighting products, solid-state lighting has a great potential to replace fluorescent lamps, mainly driven by cost savings (Chin *et al.*, 2013). It's proved in the sense of energy and money saving compared to existing light bulbs (Incandescent and fluorescent). According to McKinsey & Company (2012), the LED market is expected to grow annually 5% through to 2016 and 3% thereafter until 2020 whereby Asia is expected to achieve 45% of the global lighting market by 2020 and now Asia is currently leads the LED market in general lighting.

In Europe, many programs such as International Green Construction Code (lgCC), United Nations Environment Programmes (UNEP), Climate Group's Light Savers Program and many more global campaigns had been introduced to raise awareness on the energy lighting efficiency and accelerate the residential LED lighting market. Previous research data also showed that LED lighting value-based market share by general lighting application, residential will maintain the largest market segment and follow by office and outdoor (McKinsey & Company, 2011). Research stated residential represent almost 40% of the total general lighting market in 2011 and expected to reach almost 50% in 2016 and reach more than 70% in 2020.

SSL manufacturing has been taking initiative to reduce manufacturing cost, improve product quality and consistency to achieve stable market (US DOE, 2014). Research data stated the adoption of SSL technology in US in 2013 had achieved annual energy savings from LED lighting more than doubled compare to previous year which is about $1.8 billion. In year 2014, most of the major suppliers such as Osram, Philips were reporting LED products had contributed more than 40% of their total revenues. In Global wise, LED revenues in 2014 were $20 billion, representing 26% of total lighting revenues and this revenues amount is expected to rise 42% of unit sales, 76% of revenue by 2020. (US DOE, 2015)

Malaysia had a slow and steady foray in the LED industry since 1970s. However, recently there are increasingly transferred of the production from Cree in North America, Osram Opto semiconductor in Europe and Nichia in Japan to Asia where including HuiZhou, China and Penang, Malaysia. (US DOE, 2014) According to SME (2014),

Malaysia is now an emerging exporter of LED modules in the region, investments by SSL companies in Malaysia have increased by 30.5% from RM11 million to RM15 million. Light emitting diode industry is one of the Malaysia growth focus in 2020, either in R&D, design, manufacturing.

Energy efficiency is very important on environmental connotations, whereby lesser of energy consumption affecting on economic benefits and also directly combating climate change issue (O'Mahony *et. al.,* 2012). According to Department of Energy (DOE) report, by considering to the lifetime of the products, light emitting diodes (LED) lamps have a slight environmental edge over compact fluorescent Lamps. LED lights do not contain toxic chemicals or metals but Compact fluorescent lamps (CFLs) contains this harmful chemicals whereby averagely 5mg per CFL bulb.

In term of cost effectiveness, Environmental friendly lighting product, LED may cost more than compact fluorescent (CFL) lights. According to a study showing the cost made up during life of the bulb is higher for LED, but if running the lights in the same period, the prices are going down over time due to the life span of the compact fluorescent lamps (CFL) is shorter and need to run additional numbers of traditional incandescent bulbs for the same time period, that's reason high initial cost for LED lights. Compact fluorescent lamps and light emitting diodes only require about 20% and 25% electricity compared to incandescent lamps and last 6 and 26 times longer, respectively (CLASP, 2013).

In many countries had actually implemented bans on imports and domestic sales of incandescent light bulbs (IEA, 2010). Follow with that, studies on residential lighting

international market in recent years suggest that many households were already making the transition to purchasing more environmental friendly CFL and LED bulbs and that the trend was even increasing (McKinsey & Company, 2012). They also found that LEDs have rapidly entered the residential light bulb market, followed by their prices have declined markedly.

The growth of the LED sector is also well supported by two of the most robust Government programs, where they are The Economic Transformation Programme (ETP) under the Electronics & Electricals Sector, one of the 131 Entry Point Projects (EPP) identified as the National Key Economic Areas (NKEA) and The National Green Technology Policy, whereby their main objective is to target a low carbon economy with sustainable development (EPU, 2010).

1.4 Consumer response to environmental products

Current technology development is going toward the improvement of energy efficiency in lighting. Environmentally concern and responsibility is now obtaining higher and higher attention from society (Catlin & Wang, 2013; Leonidou, Katsikeas, & Morgan, 2013). Analyst data by Archenhold (2010) estimated value of $96 billion on global lighting market while US Department of Energy (DOE , 2011) estimated global lighting market to be approximately $110 billion.

A study from 2001 to 2010, the average efficacy of installing lighting system has been increased from 45 lm/W to 58 lm/W, however there are still very low percentage (23%) of replacement of environmental saving light (DoE,2012a). Consumers are actually paying attention on the company's investment and looking for more research and development of environmentally-friendly products (Magdalena *et. al.*, 2013). Based on a research on Malaysian consumers by Golnaz *et al.*, (2013), respondents consider themselves to be environmentalists or to promote green society are 2.175 times higher of the other respondents and respondents having green movements are 1.699 times higher than others respondents.

Supports from Malaysia government on green technologies whereby introduce Green Technology Financing Scheme (GTFS) in National Budget 2010. (GTFS, 2014). Financing support for suppliers or producers up to RM50 million and RM10 millions for user or consumers. With only four months from Jan to April 2010, there are total 44 applications had been received and estimated carbon reduction is about 1.12 million tonnes. (Ismail, 2010)

Based on the studies by Lung (2010), nearly 95% of Thai consumers and over 80% of Malaysian and Korean consumers were willing to pay more on green products, while Hong Kong and Australia consumers showed less than 60% willingness to pay more on green products. Therefore, it is interesting for this research to identify what drives Malaysian consumers to purchase environmental friendly lighting products which could contribute to firms aim to be as key players in the Malaysia environmental friendly lighting market.

1.5 Problem Statement

Many studies have showed the potential economic and social benefits from the investment of the environmental friendly lighting products. Studies by Tang and Tan (2013), technology innovation on environmental friendly sources of energy could simultaneously boost long-term economic growth and minimize environmental degradation. Zhou *et al.,* (2010) found striking returns to energy efficiency investments in China and in South Africa efforts including the distribution of 5 million energy-saving compact fluorescent light bulbs are credited with avoid to a full-scale energy crisis in 2006. Governments worldwide are implementing strategies and plans to reduce carbon emission (Ustun *et al.,* 2011). Malaysia government pledged during the United Nations Climate Change Conference (UNFCCC) in Copenhagen in 2009 to reduce its carbon emissions by as much as 40%, based on their 2005 levels, by the year 2020. Considering only of households sectors in switching the lighting products from incandescent lamps to Compact Fluorescent Lamps (CFL) and LEDs in Malaysia, electricity consumption and CO2 emission possible to reduce by 10.69% by 2020 (Hasti *et.al.,* 2015). However, current situation is Malaysia ranking in World Environmental Performance Index was significantly declined from 26 in year 2008 to 51 in year 2015 (Yale University, 2014; EPI, 2015).

In additional, previous study by Noor and Muhammad (2012) proved that the support of Malaysia consumers on green purchasing is not encouraging. There is only 30% out of 616 respondents from Malaysia have the experience on purchasing green products. This situation shows that an additional effort is required to increase the Malaysian

consumers' purchase intention on green products. This statistic shown that additional focus needed on environmental related products in order to improve Malaysia's environmental performance index.

Furthermore, studies showed that increase of the investments by oversea SSL companies in Malaysia and increasingly transferred their production into Penang, Malaysia, where including Cree in North America, Osram Opto semiconductor in Europe and Nichia in Japan (US DOE, 2014). Besides, suppliers or producers in Malaysia have been given financing support to encourage business to adopt greener practices. Also, Energy-efficient technologies are available in the market and the price are switching to affordable range for consumers. However, most of the LED products produced in Malaysia were export to other countries (Hafsah, 2014). This situation showed that Malaysian interest on environmental friendly lighting products are not encouraging.

Even though studies on the relationship between environmental knowledge, environmental concern and green purchasing behaviour has been focused but still lacking in Malaysia (Saleki & Seyedsaleki, 2012). Hasti *et al.,* (2015) also suggested government initiative and important of energy-efficient technologies knowledge might play an important role on green consumer purchase intention study. They pointed out that in order to help Malaysia's green strategy, governmental financial support possible to reduce the capital casts of these technologies. Hence, the present research is intended to bridge this gap which including environmental concern, environmental knowledge and government initiative in order to understand and analyzes the elements influencing consumers' purchase intention and willingness to pay towards environmental friendly lighting products with appropriate sample in Malaysia.

In view of the vital contribution of the environmental friendly lighting products, LED to the environment, this study could help to understand Malaysian purchase intention on environmental friendly lighting products whereby it is able to increase consumers purchase rate on LED lighting products and increase World Environmental Performance Index.

1.6 Research Objectives

By referring to the problem statement above, the main objective of this study is to understand Malaysians' adoption on environmental friendly lighting products. Potential explanation of this gap could be derived by focusing:

1. The identify environmental attitude, environmental knowledge, government initiative, perceived corporate social responsibility, environment concern, self-identity and peer pressure, possibility to influence consumers' intention to purchase environmental friendly lighting products in Malaysia.
2. To examine the relationship between consumers' purchase intention and willingness to purchase on environmental friendly lighting products in Malaysia.

1.7 Research Questions

Research questions that need to be answered are:

1. Do environmental attitude, environmental knowledge, government initiative, Perceived corporate social responsibility, environment concern, self-identity and peer pressure influence Malaysian purchase intentions on environmental friendly lighting products purchase?
2. Is the consumers' Purchase intention relation with consumer willingness to purchase on environmental friendly lighting products in Malaysia?

1.8 Definition of Key Terms

In order to share a common understanding of the concepts and for better comprehension of further discussion, the following key term's definition were referred specifically.

1.8.1 Purchase Intention

Purchase intention is conceptualized as an individual interest and probability of that person to give preference in their future purchase. (Wu *et al.*, 2014)

1.8.2 Environmental attitude

Environmental attitude can be characterized as individual's value judgment of environmental protection with favorable or unfavorable attitude towards greens products and services actually do "practice what they preach" in term of their environmental behavior. (Mei *et al.*, 2012)

1.8.3 Environmental knowledge

Environmental knowledge is known as individual have certain degree of knowledge about environmental issues and relationship concerning the natural environment. (Kaufmann *et al.,* 2012)

1.8.4 Government initiative

Government initiative refers to the role of national government to support and promote sustainability awareness to the people. (Mei *et al,* 2012)

1.8.5 Perceived Corporate Social responsibility

Perceived corporate Social responsibility contributed by a firm to meet consumer's sense of well-being. (Lee & Shin, 2010)

1.8.6 Environmental Concern

Environmental concern can be characterized as the level of emotional perceptions, emotions, knowledge, attitudes and effective action of a person towards environmental issues. (Tsarenko *et al.,* 2013)

1.8.7 Self-Identity

Self-identity is the conception one has of oneself where related to how individuals consider themselves as environmentally conscious consumers. (Tan, 2013)

1.8.8 Peer pressure

Peer pressure is a type of subjective norm where the impact of peer pressure on various pro-environmental behaviors. (Dara & Starkey, 2014)

1.8.9 Willingness to purchase

Willingness to purchase defines as the judgment of an individual and the actual action to buy the related products (Oh, 2014).

1.9 Significance of Study

With the high environment and economic concerns, many countries are taking initiative to create new business opportunities on this lighting industry transformation. Energy efficiency plays an essential role in the energy economies of all nations and to solve many electricity related issues in developing countries which will causing slow economic development and undermine quality of life (Casillas & Kammen, 2011; Chang & Carballo, 2011). Understanding consumer acceptance of environmental friendly lighting products is a very important study and how consumers make their purchasing decision with respect to environmental and economic impact.

1.9.1 Theoretical Contribution

For theoretical contribution, this research contributes to the environmental friendly lighting products (LED) purchasing literature by examining which factors influence consumers' purchasing intention on environmental friendly lighting products. The study serves to advance literature concerning Malaysian consumers in regards to their purchase intention towards environmental friendly lighting products. Findings by Kelly, *et al.*, (2014), greener consumers are positively affected by the personal and environmental resource at the same time, so there is a need to focus on the personal and

economic well-being of consumers while performing sustainability related study. Besides, there is always a difference between the observed level of adoption of consumers and that which consumers were making rational decision. Hence, this study may have theoretical significance by exploring the targeted consumer, residential market in Malaysia whereby provide a clear picture of the consumers purchase intention.

In addition, the research on environmental friendly lighting products' consumption provides advanced knowledge and learning for the marketers. Understand the factors influence consumers' purchase intention towards environmental friendly lighting products in Malaysia could bring positive outcome to boost up the environmental lighting market and reduce environmental issue. The lighting manufacturers and suppliers need to comprehend their potential customers towards environmental friendly lighting products in order to gain from the market.

Consequently, the endeavors placed in this study give a driving force to more work in related areas. The discoveries and findings can likewise be connected to different area of inquiry other than environmental friendly lighting product's consumption. The application of the TPB to environmental friendly lighting product's purchase will provide an empirically grounded model to help comprehend the basic elements impacting consumer purchase of environmental friendly lighting product' (LED) instead of less environmental friendly lighting product such as compact fluorescent (CFL) lights.

1.9.2 Practical Contribution

For practical contribution, this study is significant to environmental friendly lighting sector including manufacturers, suppliers and government. This study may be able to provide important information for improving environmental friendly lighting market by well understanding of the needs and contribution factors of potential and current purchasers. In this study, the priority was given in distinguishing and investigating the purchase intention behind potential environmental friendly lighting purchasers, which provided a priceless comprehension into their environmental friendly living environment.

At the same time, government and light manufacturers ought to supply and control on environmental friendly lighting products that are lesser and lesser harm to environment. Consequently, with a superior comprehension of consumers' purchase intention in the areas identified with their environmental concern, environmental knowledge, government initiative and peer pressure towards environmental friendly lighting products, manufacturers, suppliers and government can identify the activities needed to address their customer's needs.

Besides, the government can apply the findings of this study as a reference to develop the environmental friendly lighting products encouragement policy. Government related agencies and programs such as Economic Transformation Programme (ETP) and The National Green Technology Policy may be able to use the finding of this study to formulate strategies to improve consumer's adoption of environmental lighting products throughout Malaysia, with the aim of meeting the expectations of the consumers have for their application.

Understanding consumers' purchase intentions is an important goal for understanding demand for environmental friendly lighting products, decision making in marketing and product innovation, whereby it provide related manufacturer and marketer a source of distinctive competitive advantage in future. Government as well as investor need to understand those factors in order to accelerate the LED market.

1.10 Organization of the Remaining Chapters

This study is organized in five chapters. The first chapter presents an introduction and additionally an overview of this study. Chapter two discusses the literature of previous studies that are related to factors that drive the consumers' purchase intention towards environmental friendly lighting products, theoretical framework of this study and the development of the hypotheses. The third chapter presents the methods used to conduct this study, which includes the research design, measurements, questionnaire design, sampling, data collection, data analysis and pilot study. Next, chapter four analyzes the results that were obtained by utilizing the SPSS and PLS softwares. Various analyses such as statistical analysis, descriptive analysis, validation analysis, reliability analysis and structural equation modeling analysis were discussed. Lastly, chapter five discusses the overall findings and implications of this study, followed by the limitation of this study, suggestions for future research and conclusions.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter gives a brief overview of the recent research literature as baseline where research hypotheses and framework of the study are developed. This chapter begins by an overview of the previous literature on the key terms of this study such as environmental attitude, environmental knowledge, government initiative, perceived corporate social responsibility, environment concern, self-identity and peer pressure towards environmental friendly lighting products, and their willingness to purchase for environmental friendly lighting products.

2.2 Purchase Intention (PI)

Purchase intention plays an important indicator of successful marketing management. Purchase intention is a combination of consumers' interest and possibility on purchase of a product. It is essential to evaluate and take appropriate actions toward consumer perception and reaction. Studies by Dara and Christopher (2014) provide evidence regarding high levels of consumer's purchase intention on green transportation products and it is positive associate with willingness to purchase. They also suggested consumer attitude and peer pressure are positively associated with intention which is positively associated with willingness to pay.

Another significant studies by Chiew *et al*., (2014) on organic food products also proved that the actual purchase behavior was significantly influenced by consumer's Purchase intention and they impress that promoting buyer's intention to buy the products is necessary. Qader and Zainuddin (2011) also perform a research on lecturers in Universiti Sains Malaysia regarding lead-free electronic products (green electronics) and conceptualized green purchase intention as an individual's plan to perform some action within a specific time and the possibility that person will behave as an eco-behavior.

Supporting studies by Wahid *et al.,* (2011) indicates that green volunteers from Penang, Malaysia those possess higher education (degree and above), higher income level and female (gender) have higher green purchase behavior. Different consumers profile in Penang proved to show different level purchase intention on green products.

2.3 Environmental attitude (EA)

Every consumer has an attitude about doing something. Many studies report a strong relation between attitude and preference toward a brand or product (Kim & Ko, 2012). Di Maria *et al.,* (2010) also found that environmental attitudes and education levels are strong determinants of installation of compact fluorescent light bulbs (CFLs) in Ireland using socio-economic variables.

One of the significant findings by Kozar & Connell (2010) is there are significant proportion of their research sample whereby 80 percent of participants agreed that the environment is being abused, 56 percent of participants noted the limitation of the planet's natural resources, and 70 percent noted the potential for a major ecological

disaster. Their studies show a very positive result on environmental attitudes towards apparel purchasing behavior.

David (2011) also investigated consumer demographics and environmental attitudes influence willingness to pay for appliances produced by Green Power Partners, whereby the environmental attitude contain the variables of Effect and Climate, resulted positive effect on consumer willingness to pay for green products . Besides, a research in Sweden on consumers perceive environmental benefits of reducing electricity consumption shows as many as 84% of the respondents supporting this electricity saving measures. (Kristina & Soderholm, 2010). Beckford *et al.,* (2010) also found in their studies that environmental attitude has a significant impact on consumer environmental green purchasing behavior.

Furthermore, a study on UK consumers to sign up for green electricity found positive environmental attitudes towards green electricity adoption (Ozaki, 2011). Di Maria *et al.,* (2010) also found that environmental attitude plays an important role in his studies on adoption of energy efficiency light bulbs.

However, a supporting research on importance of environmental attitude towards energy saving found a similar results (Martinsson *et.al.,* 2011). Results shown that impact of environmental attitude is larger in higher income groups. Anyhow, in their research also indicated the complexity and difficult to grasp the connection between environmental attitudes and energy saving behavior.

Based on previous studies on the relationship of the environmental attitudes toward consumers purchase behavior, the analysis of environmental attitudes on consumer willingness to pay for environmental friendly lighting products with the stated

preferences study conduct in Malaysia able to contribute and gain understanding on consumers towards green lighting products.

2.4 Environmental knowledge (EK)

Environmental knowledge can be used to measure the consumers' ability to identify different ecologically related symbols, behaviors and concepts. Cheah and Phau (2011) stated that an individual's willingness to purchase environmentally friendly products will be influence by their attitude towards the importance of Ecological problems.

According to Travis *et al.,* (2012), research done in the Saint Lucian lighting market shows Energy efficiency knowledge is positive related with willingness-to-pay for energy-efficient bulbs and with use of compact fluorescent lighting. Another support research by Hasti *et al*., (2015) indicates that environmental knowledge has significant impact on consumer behaviors whereby information that consumer needs have to be easy to understand, reliability, new, useful and match their everyday life. Consumers with higher understanding of environmental issues are strongly contributed to consumption behavior. Supporting studies by Kanchanapibul *et al*., (2014) confirms that young consumers' green involvement and their actual purchase is significant related with their ecological knowledge.

Tan (2011) found that environmental knowledge has a significant influence on the green purchase behavior of Penang green volunteers. Furthermore, Aman *et al.,* (2012)

stated that if the consumers have knowledge about the environmental issues, then their awareness level would increase and thus would, potentially, promote favorable attitudes towards green products.

According to Di Maria *et al.,* (2010), similar studies also proved that importance of education, information and environmental awareness in the adoption decision on compact fluorescent light bulbs. Energy consumption reduction by providing information about energy use and efficiency option in policy has proved. Some studies found that specific information frequently provided will bring effect on energy savings (Ellegard *et. al.,* 2011).

In contrast, a study by Rahbar and Wahid (2010) indicated that Penang consumers are still in the first stage of environmental knowledge. Their knowledge about environmental issues is not enough specific. In other words, they have only general environmental knowledge. Their result shown no significant relationship between environmental knowledge and purchase intention and indicates that high level of environmental knowledge not necessary show positive purchase intention. In view of contradicting findings from the extant literature, this research would like to test the relationship between consumer environmental knowledge and purchase intention on environmental friendly lighting products.

2.5 Government Initiative (GI)

The role played by the government in environmental protection is undeniable and this was highlighted by consumers on the importance of environmental laws and regulation. (Magdalena *et al.,* 2013). Results from a study on Malaysian consumers, it was found that government's role plays an important predictor of green purchasing behaviour (Sinnappan & Rahman, 2011).

According to International Energy Agency (2010), significant increase in demand for the environmental friendly products is predicted and it's just depends on the rapidity of policy implementation across countries. Government initiative to promote sustainable events could bring sustainability awareness to their people. According to tenth Malaysia plan (2011-2015), one of the initiatives of Malaysia government to drive energy efficiency effort is to phase out incandescent light bulbs by 2014 which estimated to reduce carbon dioxide emissions about 732,000 tonnes and this action possible to reduce energy usage by 1,074 gigawatts a year in residential sector. In this connection, the Malaysian government has taken various action and implement strategies to achieve better target on sustainable consumption and development (Chen & Chai, 2010). Government policies such as encouraging car-pooling and providing incentives to green product manufacturers that promote the country environment sustainability are important to help the marketers in promoting their green product.

Based on Sinnappan & Rahman (2011) and Hasti *et al*., (2015) research, the government's role could be one of the predictor on green purchasing behavior, where both researchers claimed that consumers believe the enforcement of legislation such as

carbon emission tax will help in improving and promoting in green purchases. Malaysia government has arrange and forms a new ministry of Energy, Green technology and Water and also established Environment Quality Act as Government initiative towards green movement. Findings from Travis *et al.,* (2012) in a research on energy-saving technologies in Saint Lucia also support the argument where government-sponsored education and subsidy programs will increase consumers' usage on energy-saving technologies.

Besides that, another evidence shown by Gillingham and Palmer (2013) suggests that financial subsidies on high efficiency vehicles and penalties on low efficiency vehicles and tighten of the vehicles efficiency are directly effect on the usage rate of both new and used vehicles. This action had bring the positive side effect on accidents rate and local air pollution.

Wang *et al.,* (2011) conducted a research related to policy measurement and implications for household electricity saving behavior in Beijing. They found that policy design brings different effect and motivations on the household electricity consumption efficiency. Government support such as education campaign to improve household electricity saving skills and knowledge, financial benefits play an important role to stimulate reductions in electricity consumption. But in their studies, environment awareness has no significant influence on consumer electricity saving actions.

National policy has played an important role in the development of the industry in several national such as US, Japan, China. For example, Chinese government invested billions of dollars as their support on SSL industry, whereby local governments are giving incentive money to local LED manufacturing and support on purchasing SSL

streetlights. (Sanderson & Simon, 2014). Anyhow, some previous studies suggested that subsidies are less influences on environmental action (Gadenne *et al.,* 2010).

2.6 Perceived corporate Social responsibility (CSR)

Social responsibility issues such as forced labor , low wages , long working hours, physical and psychological abuse have increasingly gain attention from society where the example of their action including boycotting of pirated goods and support for companies that have acted ethically on their business role. Green and Peloza (2011) indicates that CSR determines consumer support. Peloza and Shang (2011) in their recent review of the CSR literature categorized CSR activities into philanthropy, business practices and product related activities.

Findings proved that the important of CSR as a factor to influence consumer purchase intention where it would directly contribute to public image and influence consumer perception.(Sheehan & Thomas, 2014; Freeman *et al.,* 2010). Orose (2014) also identified corporate social responsibility is one out of thirteen motives for consumers to adopt LED lamps in Thailand. From the study stated that if a company has a reputation for long-standing commitment to environmental conservation, that company is considered more trustworthy than its counterpart, which means they have higher corporate social responsibility is perceived to be and higher opportunities to attract consumers to purchase LED lamps from that company.

Furthermore, Lee and Shin (2010) provide a clear image on consumer's perception and awareness of CSR activities. They revealed that there is a positive relationship between the consumers' awareness of CSR activities and consumers' purchase intentions. Study showed that higher awareness level of CSR activities corporate social contribution and local community contribution, higher the results on consumers' purchase intention. However, it proved to have little effect on consumer purchase intention by corporate environmental contribution, this activities are less recognise by consumers.

2.7 Environmental Concern (EC)

Many studies had been found that the influence of environmental concern on green purchase behavior (Irawan & Darmayanti, 2012; Aman *et al.*, 2012; Albayrak *et al*., 2013). Tsarenko *et al.*, (2013) also identified that environmental concern has strong relationship on environmentally sustainable consumption and it is stronger than self-image factor towards purchase of environmentally friendly products. Lu *et al.,* (2014) explored factors that influence the intention of green purchase and found that environmental concern is one of the strongest predictors of purchase intention on green products.

Based on Akehurst *et al.,* (2012) online survey, a study on the determinants of ecologically conscious consumer behavior (ECCB) and identified the factors influence green purchase behavior. They identified consumers with higher ECCB have shown higher intention to purchase green products and perceived consumer effectiveness provides the greatest insight into ecologically conscious consumer behavior.