

# HOUSEHOLD'S ENERGY EFFICIENCY BEHAVIOR: THE ROLE OF KNOWLEDGE, ATTITUDE AND SOCIAL INFLUENCES

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**ABSTRACT:** *This study aims to explore consumer's knowledge and buying behavior for energy efficient products in Malaysia. Study examines knowledge as an extended factor to the behavioral science theory called as theory of Reasoned Action (TRA). Structural equation model (SEM) technique was used in analyzing the data collected from 392 working respondents. Finding indicates individual with a good knowledge on energy efficient product will positively correlate with consumer attitude on environmental issue. With the positive attitude then will significantly relate to the consumer's intention to buy energy efficient product. By assessing the impact of knowledge, as well as other factors then greater insight is gained with regard to energy conservation and green consumption behavior. This finding will be valuable in gaining information to businesses on understanding the important of knowledge and attitude in promoting and marketing energy efficient products in the future.*

**Key words:** Energy Efficient Product, Knowledge, Purchase Intention, Theory of Reasoned Action.

## INTRODUCTION

In Asian countries, economic growth, rising population and rapid urbanization are the major causes of increasing demand for energy [1]. To achieve nation's macroeconomic objectives many of the countries are averse to the notion of energy conservation and efficiency and consider it their priority to first ensure economic growth and deal with energy saving later. However, a well-conceived energy efficiency strategy will not only allow them to attain their goal with much lower energy consumption but also enable them to improve the living standards and quality of life, while making human and financial resources available for other aspects of societal development such as education and healthcare.

Study [2] mentioned that consumption and environment are closely related. Any changes in consumption patterns are likely to have strong implication on the health of the global environment. Household purchase decisions are particularly important. Goods and services bought by consumers and the way they use them have a direct impact on air and water pollution, waste generation, habitat alteration and climate change. The early studies [3][4] on consumerism agreed that the consumption and generation of electricity not only put pressure on the energy resources but on the other hand emit greenhouse gases (GHG) such as carbon dioxide (CO<sup>2</sup>), carbon monoxide (CO) and nitrogen oxide compounds (NO<sub>x</sub>). Energy sectors are responsible for approximately 65% of GHG emissions generated by human activities [5]. GHGs, mainly CO<sup>2</sup>, become quite stable once released into the atmosphere and keep absorbing thermo radiation from the earth's surface, which accelerates global warming and contributes to global climate change [4].

Presently in Malaysia, the environmental issue has received attention not only from the government but also from business sectors [6]. The Malaysian market for environmental services, which barely existed a decade ago, has grown by 30 to 40 percent a year. Energy efficiency products are one of the responses to concern for the environment. The success of a product highly depends on consumer acceptance. The demand for new product such energy efficient appliances should thus be studied before they are success marketed in a competitive industries. Although an energy saving market has

expanded in recent years, it remains small. Some researchers argue that consumers' lack of knowledge concerning energy efficient products is an important factor slowing down growth.

Since energy efficiency products are relatively new for Malaysia business, there are only few studies about the product and marketing in Malaysia. Therefore, it is imperative to understand consumer's behavior towards energy efficiency products in Malaysia, where the trend is still new. Based on the above problem, this study was developed to investigate the consumer's knowledge and buying intention related to the energy efficient products. This is accomplished by applying the Theory of Reasoned Action (TRA) [7]. This theory stated that individual's behavior is determined by his/ her behavior intention, which in turn is defined as a function of attitude toward the behavior and subjective norm. The theory thus predicts intention to perform behavior by the attitude toward that behavior rather than by attitude toward a product. This perspective may be particularly useful for predicting behavior in the energy saving industry because in this context consumers often decide to perform behavior that can associate with desirable outcomes. Second, this study interested to investigate to role of knowledge in enhancing the consumer's attitude as an extended factor to the TRA. Then, we are also exploring in what extent the consumer subjective norm and knowledge – consumer's intention behavior link is mediated by the consumer's attitude. This paper is organized in four sections. The first and second part was introduced the important of study in the context of energy conservation. Section 3 explained about methodology and data collection. Section 4 discussed the study's result and the final work of this paper is summarized in the last section with discussion, study implication and suggestions for future research.

## LITERATURE REVIEW

### Definition of energy efficiency

Energy efficiency simply means to conserve the use of energy, to use less to accomplish the same task. It is something that effects every single individual, from purchasing energy saving household appliances, to the use of more efficient industrial equipment, both of which will help

the end user save energy, reduce cost of operations and in the process still able to generate the same desired results even better [8]. Lesser use of electricity may on the surface be seen as reducing the bottom line of any utility company, but on the contrary, when viewed from a macro scale, it reduces the amount as well as cost of raw materials required to produce electricity which has today resulted in a difficult and increasing global demand for coal and in the process provides an even greater platform for economic growth and productivity. Study [9] mentioned energy efficiency covers the efficiency of power generation, transmission and distribution of electricity as various end uses of energy such as in the industrial, commercial and residential.

### Energy efficient products in Malaysia

The promotion of energy efficiency as a policy has often been identified as the most cost effective tool to manage the demand for energy [10]. Developing and maintaining wide-scale energy saving policies are considered to be the most reliable, technically acceptable, economically affordable, and environmentally sensible way to overcome the negative consequences of energy production and consumption. Development of energy sector in Malaysia is guided by three principal objectives of National Energy Policy which was introduced in 1979 that is supply objective, utilization objective and environment objective. The aim of the utilization objective is to promote efficiency utilization of energy and discourage wasteful and non-productive patterns of energy consumption [8].

The Energy Commission in 2005 has introduced the electrical appliances energy efficiency and labeling program in an effort to promote culture of voluntary improvement amongst manufacturers. This action support by introducing the eco-labeling programs called ENERGY STAR rebate program in 2011. This program is under national Key Economic Area (NKEA) through Entry Point Project 9 (EPP9) initiates to improve energy efficiency in the country [9]. The rationale for the program is that there exists a variety of goods and services which can be considered either green or brown (non-environmentally friendly) goods. Eco-labeling programs designed to allow consumers to differentiate green and non-green product. But the question is how this program benefits Malaysian consumer. Many of the study done in developed countries found an eco-labeling program significantly influence consumers' willingness to pay for green products [11,12,13]. However the issue of consumer preference and acceptance of energy efficiency is still being questioned in Malaysia environment.

### Factors of consumers' buying behavior

Consumer's demand has led to increase in diversity of green categories, such as laundry detergents, personal care products, organic foods and energy saving electronics. Studies shown that costs are still a major obstacle to consumer's ability to buy green products in developing nations, and it plays a large part in decision making everywhere [14, 6. Most of previous studies have focused on the importance of consumers' knowledge in encouraging consumer's purchasing toward green innovation products. If the consumer has a good knowledge about the environmental issues, then their awareness level would increase and thus

would potentially promote favorable attitude towards green products and buying behavior [15][16][17][18]. Knowledge on environment evolves in two forms; first, consumers have to be educated to understanding the impact of product to environment; and second, consumer's knowledge in the product itself being produced in an environmentally friendly way [16].

Knowledge has been recognized by marketing research as a factor that influence every stage of the buying decision process. Knowledge is an important variable that affects the way in which consumers gather and organize information and determines how they evaluate products and services. Study amongst Penang's environmental volunteers found that the environmental knowledge having significant impact to green purchasing behavior of green volunteers in terms of their ranking of important [19]. However research conducted in Selangor found different results with 70 percent of respondents have high level of environmental concern and knowledge but moderate level of green consumerism practices [20]. Most of the respondents use green products occasionally. Similar finding found among young Malaysian consumer which shows a moderate level of sustainable consumption behavior [3]. Even the product claimed to be environmental friendly, but the acceptant of the product is still low.

Next, based on TRA model, [7] mentions the important of attitude and subjective norm in influencing behavior of individual. All other factors which influence the behavior only do so in an indirect way by influencing attitude or subjective norm. An attitude was defined as individual opinion a behavior is positive or negative, while a subjective norm is a perceived social pressure arising from one's perception. Consumer's subjective norm describes the social pressure an individual feels to perform or not to perform the behavior. Together attitudes and subjective norms are thought to influence behavior intention. This study was extent the TRA model which tests the consumer's knowledge, attitude and subjective norms with relates to consumer's buying behavior on energy efficient products. Based on the above discussion, below are proposed study's framework (Figure 1) and hypothesis.

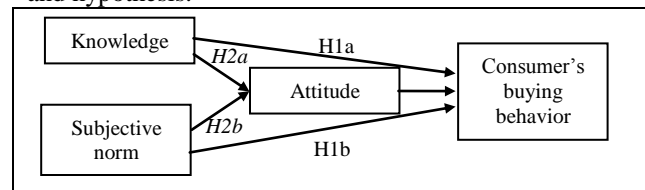


Figure 1: Proposed research framework

Hypothesis 1: Knowledge and subjective norms are significantly related to the consumer's buying intention.

#### Sub-hypothesis:

H1a: There is a significant relationship between knowledge and consumer buying intention for energy efficient products.

H2: There is a significant relationship between subjective norms and consumer buying intention for energy efficient products.

Hypothesis 2: consumer's attitude mediates the relationship between consumer's knowledge and subjective norms with consumer's buying intention.

*Sub-hypothesis:*

H2a: Consumer's attitude mediates the relationship between knowledge and buying intention.

H2b: Consumer's attitude mediates the relationship between subjective norms and buying intention.

## METHOD OF STUDY

### Subjects and procedure

This study involves conducting a survey to obtain the data for statistical testing of the formulated hypothesis. The data analyzed in this paper was collected from six cities in different states in Malaysia, which are Selangor, Kuala Lumpur, Putrajaya, Kelantan, Pahang and Terengganu. Direct face to face interviews with respondents were undertaken during the survey. The face to face interview offered one-on-one interactions with the consumers and provided an opportunity to explain some of the questions to respondents with low literacy levels. This method was vital to ensure high reliability and accuracy of the data collected. Using convenient sampling and shopping mall intercept method, 500 consumers were selected to participate in the survey and 392 completed answers were used in data analysis.

### Measurement and data analysis

This study adapted the measures used to operationalize the constructs included in the investigated model from relevant previous studies, making minor wording changes to fit these measures to the context of study. The measures of buying intention adapted from Lin [21]. There are three questions developed for intention such as "I used to buy energy efficient products, but do not buy them recently". The attitude and subjective norms were revised from Chiou [15]. Consumer's attitude are measured by five items as "I am always look for eco-label before buying a product", and five items were used to measure subjective norm as "My friends suggests me to buy energy efficient products". All items were measured using a six point Likert-type scale (ranging from 1 = strongly disagree to 6 = strongly agree). With the establishment of content validity, the questionnaire was refined through rigorous pre-testing. The pre-testing focused on instrument clarity, question wording and validity. During the pre-testing, 30 consumers were taken as subjects and invited to comment on the questions and wordings. The comments of these 30 individuals then provided a basis for revisions to the construct measures. Several items were removed from the instrument based on the feedback from the pre-testing subjects.

The hypothesized models are empirically tested using the structural equation modeling (SEM) approach, supported by AMOS 20 software. We follow the two-stage model-building process in applying SEM for data analysis. The measurement model was estimated using confirmatory factor analysis (CFA) to test reliability and validity of the measurement model, and the structural model also was analyzed to examine the model fit results of the proposed theoretical models.

## EMPIRICAL RESULT

### Measure reliability and validity

The study instrument used confirmatory factor analysis (CFA) to examine the reliability and validity. For the measurement quality we followed the suggestion of Zainudin [22] by testing construct reliability, convergent validity and discriminant validity. For a good model fit, the chi-square normalized by degree of freedom ( $X^2/df$ ) should not exceed 5, goodness of fit index (GFI) should exceed 0.9, adjusted goodness of fit index (AGFI) 0.9, comparative fit index (CFI) should exceed 0.9, non-normed fit index (NNFI) should exceed 0.9 and root mean squared error (RMSEA) should not exceed 0.08. Result in the CFA analysis shows that the  $p$ -value was significant and other fit indices were assessed are suggesting adequate model fit. Table 1 shows the study's fitness model suggesting adequate model fit.

**Table 1: Fitness index for the measurement model**

Category	Index	Index value
Absolute fit	RMSEA	0.067
Absolute fit	GFI	0.929
Incremental fit	CFI	0.950
Parsimonious	Chisq/df	2.780

Confirmatory factor analysis explains the results of internal reliability and convergent validity for the study's constructs. Internal consistency reliability used to test unidimensionality and assessed by Cronbach's Alpha. The results of alpha value are 0.66, 0.62, 0.76 and 0.78 for intention, knowledge, attitudes and subjective norm respectively, which were above the accepted threshold 0.60. Convergent validity is the degree to which multiple attempts to measure the same concept in agreement. Convergent validity was assessed based on factor loading, composite reliabilities, and variances extracted. The factor loading for all items exceeds the recommended level of 0.6 except for one item for knowledge.

### Structural Equation model

**Table 2: Multiple regression result for the effect of consumer's knowledge and subjective norms on buying intention.**

Variables	Intention (B)
Knowledge (KNOW)	0.27*
Subjective norms (SN)	0.46*
$R^2$	0.34

*Note: N = 392, \*  $p < 0.01$  level (2-tailed)*

Table 2 showed the fit statistics for study's structural equation model. The model displayed a good fit with the data, compared with the suggested fit criteria. The result of structural model revealed a  $X^2$  of 149.723 ( $df = 39$ ,  $p < 0.01$ ;  $X^2/df = 2.07$ ), CFI of 0.946, GFI of 0.936, NFI of 0.929, and RMSEA of 0.085. All relationships proposed by the model were significant. Overall fit was excellent. *H1a* is predicting a positive relationship between consumer knowledge and intention to buy, was statistically significant ( $\beta = 0.27$ ,  $p < 0.001$ ). Then the proposed relationship (*H1b*) between subjective norm and consumer's intention to buy energy efficient products was also significant in the study's data ( $\beta = 0.46$ ,  $p < 0.001$ ). Thus the study accept *H1a* and *H1b* which is there are positive relationship between knowledge and subjective norms with buying intention. For testing a mediation effect, study conduct the multiple regression by

four step proposed by Baron and Kenny [23]. In step 2a of the hierarchical multiple regression analysis (Table 4), knowledge and subjective norm was found significantly related to intention to buy with 34 percent variance explained in the model. Then the study test for the second step between knowledge and subjective norm to the mediating variable attitude, whereas both variables are significant to consumer's attitude. The third step was the relationship between mediation and dependent variable. It can be seen that the mediating variable (attitude) was positively and significantly related with the dependent variable (intention), thus fulfilled the third step requirement of Baron & Kenny's mediation test procedure. Hence met the first, second and third mediation procedure. Then, in the final step (2d), the independent variable (knowledge and subjective norms) that significantly related with intention in step 2a and mediator, step 2b (attitude) was tested on the dependent variable (intention) simultaneously. The result of this analysis shows that attitude found to mediate the relationship between subjective norms and consumer's intention.

Based on the Sobel's test for mediation effect, we found that the attitude has a strong mediation effect of the relationship between subjective norms and intention. Then the type of mediation is partial mediation since the direct effect of independent variable on dependent variable is still significant after mediator entered the model even though the beta coefficient for subjective norm is reduced from 0.46 to 0.33. Thus, this finding support hypothesis 2b, but not support hypothesis 2a when trying to show the mediating effect of attitude on the relationship between knowledge and buying intention.

**Table 3: Multiple regression result for the effect of attitude in mediating the relationship between knowledge and subjective norm on consumer's buying intention.**

Variables	INT.	ATT.	INT.	INT.	Z test
	Step 2a	Step 2b	Step 2c	Step 2d	
	B	B	B	B	
KNOW	0.27*	0.58*	-	-0.07	-0.685
SNORM	0.46*	0.21*	-	0.33*	3.969*
ATT	-	-	0.63*	0.61*	
R2	0.34	0.44	-		

Note: N = 392, \*p<0.01 level (2 tailed), z-test for mediation effect.

## DISCUSSION

From structural modelling analysis, knowledge and subjective norm were found significant related to enhancing consumers' intention to buy energy efficient products. The result indicates that knowledge relates directly on consumer buying intention. This study also verified attitude as an important factor in mediating the relationship between consumer's subjective norms and buying decision. This finding shows the importance of social influences in influencing consumer intention to buy energy efficient products. If people think their significant others (such as families and friends) want them to perform the behavior, this results in a higher motivation and intention to perform the behavior. Subjective norms of peer group include thoughts such as, "my friend suggest me to buy an energy efficient products". This result also indicates the importance of attitude in mediating the relationship of subjective norm and buying intention. According to TRA, attitudes toward

behavior are determined by their accessible beliefs about behavior, where a belief is defined as the subjective probability that the behavior will produce a certain outcome. From mediating analysis, result confirmed that when consumer belief their social influence as family and friends said buying energy efficient products is good then this will give a positive attitude and then enhance consumer intention on buying energy efficient products.

This research and its theoretical basis hold valuable implications for the growing literature on attitude formation and consumers' buying intention behavior tendencies, which form an important individual level construct for better understanding green marketing strategies. The findings of this study were corresponding to a number of findings in previous studies [2,18,24,25]. Therefore, this information can be used by marketers to improvise their marketing strategies. Green marketing is a continuous process that requires constant inputs from the suppliers, government legislations and policies and consumers. This is required so that the businesses green marketing strategy can be aligned to the target markets and gain a sustainable competitive advantage. It is important that strategies and policies in relation to green products be developed and implemented so as a guide and help the producers and customers towards a green change.

The study has a number of limitations, which are areas to consider for further research. First, the lack of examination of socio-demographic effects in the model tested is a potential shortcoming of the interpretation of the findings. Demographically, environmentally friendly Malaysian consumers and shoppers were found to diversely spread along all the income ranges, age, education levels and various household sizes. Thus it is important for future research to explore the relation of consumer's demographic factors and intention to buy energy efficient products in Malaysia.

## CONCLUSION

In general, regarding the effort of achieving energy efficiency in Malaysia, the government has recognizes the benefit and importance of energy efficiency in the country and several plans and measures have been taken to ensure economic, energy and environmental sustainability. This includes the drafting of National Energy Efficiency Master Plan, which is in the process of implementation. From this study, it is important to develop a positive attitude on energy efficiency and also the awareness must be enhanced and a culture of energy conservation must be developed for the initiative to gain further momentum. The outcome of the study will contribute to the enhancing consumer's knowledge, attitude and the role of social influences by making pragmatic policy recommendations that formulate strategies for addressing bottlenecks in accessing energy services by consumers. Understanding the consumer's knowledge, attitude and subjective norms toward the environmental products will provide invaluable insights into consumer oriented market segment with new avenues for marketers' thought into green marketing strategy. The findings of this study have implied that urban Malaysia may be more effectively targeted by the marketers using the strategies which encourage these groups to be more eco-friendly user. As mentioned in previous

studies, the cost of the product has been the first factor to be considered in purchasing decision. So it is the duty of the government to create a climate in which the consumer could get some purchasing power as its will, consistent with the positive attitude of Malaysian consumer toward green innovation products.

Energy efficiency has created business and jobs and reduced waste, pollution and costs. It has been a good investment for our economy. Looking at the future, the need for more energy efficiency is glaring. Energy efficiency is an important means and initiative towards the development of sustainable energy and reducing the impact of the energy sector on the environment. The government of Malaysia recognizes the benefit and importance of energy efficiency in the country and several plans and measures have been taken to ensure economic, energy and environmental sustainability.

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