

Modelling The Causal Effect of Knowledge on Consumer's Purchasing Behaviour: The Case of Energy Efficient Appliances in Malaysia

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Abstract

Although the energy saving market has expanded in recent years, it remains small. Some researchers argue that consumers' lack of knowledge concerning energy efficient product is an important factor slowing down growth. This paper aims to focus on the factors influencing knowledge with regard to energy efficient products and the relationship between knowledge and consumer attitudes and motivation to purchase energy efficient products. A literature review is presented, relating to the impact of knowledge on consumer behaviour in general and, more specifically on energy efficient buying behaviour. Several hypotheses are formulated concerning the relationship between knowledge, attitude and buying behaviour. This study examines the theory of Reasoned Action (TRA) and analyse the data collected from 380 working respondents who were asked their views concerning knowledge about energy efficient products, attitude and purchase intention of energy efficient product using the structural equation model (SEM) technique. Finding indicates individual with a good knowledge on energy efficient product will positively correlate with consumer attitude on environmental issue. With the positive attitude will significantly relate to the consumer's intention to purchase energy efficient product. By assessing the impact of knowledge, as well as other factors, energy efficient products, greater insight is gained with regard to energy conservation and green consumption behaviour.

Keywords: Knowledge, subjective norm, attitudes, intention to buy and energy efficient product.

1. INTRODUCTION

Consumption is a key lever to achieving more sustainable development. Unsustainable consumption patterns are major causes of global environmental deterioration, including the overexploitation of renewable resources and the use of non-renewable resources with their associated environmental impacts. The European Environmental Agency was reported on 'household consumption and the environment' identifies the need areas of food, housing, personal travel and mobility as well as tourism to be the four major areas of household consumption with the highest negative environmental impacts (EEA, 2005). For the period until 2020, consumption growth is expected to continue approximately at the same rate as GDP growth, i.e. 2-3% annually. Technological innovations have reduced the energy and material intensity of most products but the increasing volumes of consumed goods have outweighed these gains. Household energy consumption contributes to almost 30% to the total final energy consumption in the world and is, after transport, the second most rapidly growing area of energy use.

In the context of Asian countries, rapid urbanization, high economic growth and rising population are the major causes of increasing demand for energy (United Nations, 2011). To achieve these nation's macroeconomic objectives, thus many 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. 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.

In realizing the above issues government agencies have taken various actions to exploit consumers' preferences for energy efficient products. But despite consumer sensitisation toward sustainability issues, energy efficient products faces slow rates of acceptance in mainstream markets as consumers' green preferences regularly fail to translate into adoption behaviour (Cheah & Phau, 2011). As a result, in many countries green innovation products has been suffering for a year in the chasm between early adopter and mainstream markets and are often dependent on the government policy support in form of tax incentive or subsidies (Suruhanjaya Tenaga Malaysia, 2013). Energy efficient products thus shares a similar fate with green innovations like hybrid car, organic foods, organic cosmetics and many of other green innovation products which all failed to develop significant share in consumer market (Bonini and Oppenheim, 2008).

Thus understanding of the consumer's knowledge and attitudes toward environmental issues and consumption of energy efficient products may be particularly important due to the previously outlined discrepancy between consumer opinions about environmental issues and actual purchase behaviour. It has been previously shown, for instance, that a consumer generally concerned about the

environment may still not be proactive in a behavioural sense unless he/she feels that individuals can play an active role in positively affecting the environment (Benton, 1994).

Based on the above problem, this study was developed to investigate the consumer's knowledge and attitudes related to the energy efficient products. This is accomplished by applying the Theory of Reasoned Action (TRA) (Fishben and Ajzen 1975). This theory stated that individual's behaviour is determined by his/ her behaviour intention, which in turn is defined as a function of attitude toward the behaviour and subjective norm. The theory thus predicts intention to perform behaviour by the attitude toward that behaviour rather than by attitude toward a product. This perspective may be particularly useful for predicting behaviour in the energy saving industry because in this context consumers often decide to perform behaviour that can associate with desirable outcomes (Bang et al. 2000). 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 explore in what extent the consumer subjective norm and knowledge – consumer intention behavior link is mediated by the consumer's attitude.

Thus in this paper, we will test the model on consumer behavioural changes called as theory of Reasoned Action (TRA) on the individual demand analysis of domestic appliances user. It will give an overview of the determinants of individual consumer decisions on buying energy efficient products or appliances. Thus these study hypotheses are as follow:

Hypothesis 1: knowledge and subjective norm are significantly related to the consumer' intention.

Sub Hypothesis:

H1a: There is a positive relationship between consumer's knowledge and consumer' intention.

H1b: There is a positive relationship between subjective norm and consumer' intention.

Hypothesis 2: Consumer's attitude mediates the relationships between consumer's knowledge and subjective norm and consumer' intention.

Sub Hypothesis:

H2a: Consumer's attitude mediates the relationships between consumer's knowledge and consumer' intention.

H2b: Consumer's attitude mediates the relationships between consumer's subjective norm and consumer' intention.

2. METHODOLOGY

2.1. Subjects and procedure

The data analysed in this paper was collected from six cities in different states in Malaysia, which is Selangor, Kuala Lumpur, Putrajaya, Kelantan, Pahang and Terengganu during November 2013 until January 2014. Direct face to face interviews with respondents were undertaken during the survey. Cooper (2002) points out that a direct face to face interview is more reliable approach in survey studies. 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.

2.2. 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 purchase intention adapted from Lin (2007). 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 (1998). 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 Star 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 analysed to examine the model fit results of the proposed theoretical models.

3. EMPIRICAL RESULT

3.1. 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 Joreskog (1973), Lei & Wu (2007) and Zainudin (2011) by testing construct reliability, convergent validity and discriminant validity. For a good model fit, the chi-square normalized by degree of freedom (χ^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. Figure 1 (appendix) show the result of measurement model of the study based on AMOS graphic. Table 1 show the study's fitness model suggesting adequate model fit.

Table 1: Fitness index for the measurement model

Category	Index	Index value	Comments
Absolute fit	RMSEA	0.067	The required level achieved
Absolute fit	GFI	0.929	The required level achieved
Incremental fit	CFI	0.950	The required level achieved
Parsimonious fit	Chisq/df	2.780	The required level achieved

Table 2 summarized the results of internal reliability and convergent validity for the study's constructs. Internal consistency reliability to test unidimensionality was assessed by Cronbach's Alpha. The resulting 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 suggested by Nunnally and Bernstein (1994). 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 results of the convergent validity are shown in Table 2. The factor loading for all items exceeds the recommended level of 0.6 except for one item (K3 for knowledge).

Table 2: Result of CFA for measurement model

Construct	Item	Factor loading	Cronbach Alpha
Intention	N2	0.62	0.661
	N4	0.64	
	N5	0.67	
Knowledge	K1	0.75	0.629
	K2	0.68	
	K3	0.56	
Attitudes	A2	0.70	0.768
	A4	0.67	
	A5	0.78	
	A6	0.71	
Subjective norm	SN2	0.75	0.785

SN4	0.82
SN5	0.90
SN6	0.72
SN7	0.73

NOTES: All *t*-value are significant at $p < 0.001$

3.2 Structural Equation Model

Table 3 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. Additionally, Figure 2 displayed all of the relationships among studied variables. Path coefficients and their significant, R^2 for dependent construct are also presented in this figure. The result of structural model revealed a χ^2 of 149.723 ($df = 39$, $p < 0.01$; $\chi^2/df = 2.07$), 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 ($\beta = 0.46$, $p < 0.001$). As shown in AMOS graphic in Figure 2 (appendix), knowledge and subjective norm are significantly related to consumers' buying intention. Thus the study accept H1a and H1b which is there are positive relationship between attitude and subjective norm with purchase intention. In general, the results of the proposed model in this study are consistent with those of prior Theory of Reasoned Action studies (Aertsens et al., 2011; Aman, Harun, & Hussein, 2012; Ha, 2012).

Table 3: Multiple regression result for the effect of consumer's knowledge, subjective norm on consumer's intention

Variables	Intention	
	Model 1a	Model 1b
	B	B
Knowledge	0.27***	-0.07
Subjective norm	0.46***	0.33***
Attitude	-	0.61***
R^2	0.34	0.56

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

Table 4: Regression weights

Hypothesis	Estimate	Std. regression weight	S.E.	C.R.	<i>p</i>	Result
H1a:INT ← knowledge	0.240	0.274	0.064	3.763	0.001	Accepted
H1b: INT ← Sub. norm	0.252	0.457	0.039	6.464	0.001	Accepted

Note: S.E. = Standard error, C.R. = Critical ratio, p = Significant value

For testing a mediation effect, we conduct the multiple regression by four step proposed by Baron and Kenny (1986). In step 2a of the hierarchical multiple regression analysis (Table 5), 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 norm) 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 consumer knowledge and subjective norm with consumer's intention. Based on the Sobel's test for mediation effect, we found that the attitude has a strong mediation effect for the relationship between subjective norm 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.

Table 5: Multiple regression result for the effect attitude in mediating the relationship between knowledge and subjective norm on consumer's intention

Variables	Intention	Attitude	Intention	Intention	Mediation test (z)
	Step 2a X - Y	Step 2b X - M	Step 2c M - Y	Step 2d X - M - Y	
	B	B	B	B	
Knowledge	0.27***	0.58***	-	-0.07	-0.685
Subjective norm	0.46***	0.21***	-	0.33***	3.969***
Attitude	-	-	0.63***	0.61***	-
R^2	0.34	0.44			-

Note: N = 392; ** p< 0.01 level (2-tailed).

Table 6: Sobel Test – mediation effect of attitude on the relationship between consumer's knowledge and subjective norm and intention to buy energy efficient products.

Indirect effect	<i>a</i>	<i>sa</i>	<i>b</i>	<i>sb</i>	<i>z</i>
Knowledge-attitude-intention	-0.06	0.087	0.52	0.086	-0.685
Subjective norm-attitude-intention	0.20	0.038	0.52	0.086	3.969***

Note: *** Correlation is significant at the 0.01 level (2-tailed).

4. Discussion and conclusion

Energy efficiency is an important means and initiative towards the development of sustainable energy and reducing the impact of energy sector on the environment. This current study tested the relationship of two variables (knowledge and subjective norm) on consumers' green purchasing intention in specific context of energy efficient product by using the Theory of Reasoned Action in explaining theoretical framework of the study.

From the structural modelling analysis, knowledge and subjective norm were found significant related to enhancing consumers intention to buy energy efficient products. This research and its theoretical basis hold valuable implications for the growing literature on attitude formation and consumers' buying intention behaviour 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 (Aertsens et al., 2011; H. Ha, 2012; Aman et al., 2012; Mei, Ling, & Piew, 2012). 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 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.

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 environment 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 attitude and the role of social environment by making pragmatic policy recommendations that formulate strategies for addressing bottlenecks in accessing energy services by

consumers. Understanding the consumer's attitude and subjective norm 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. 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.

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APPENDIX

Figure 1: Measurement model

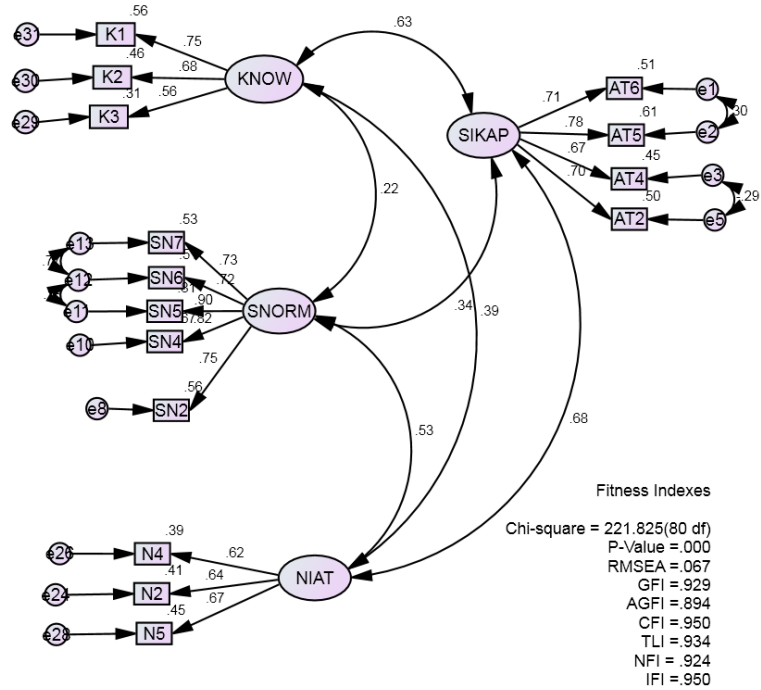


Figure 2: Model 1a

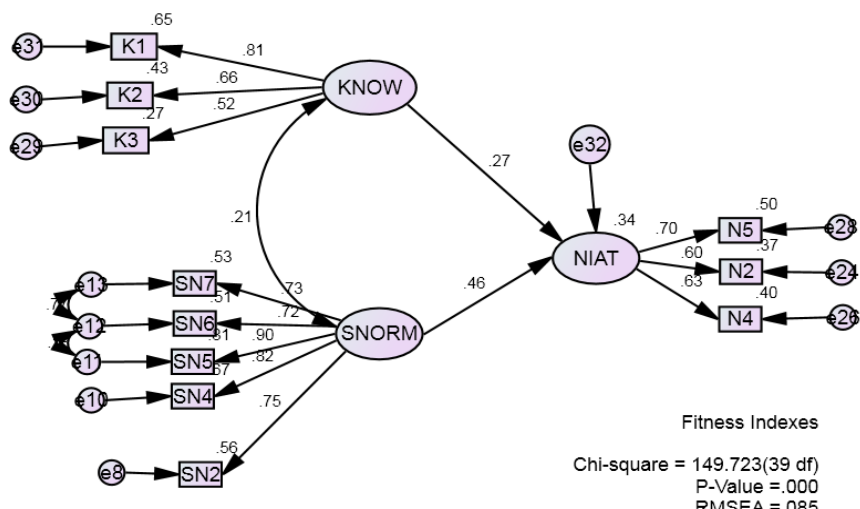


Figure 3: Model 1b

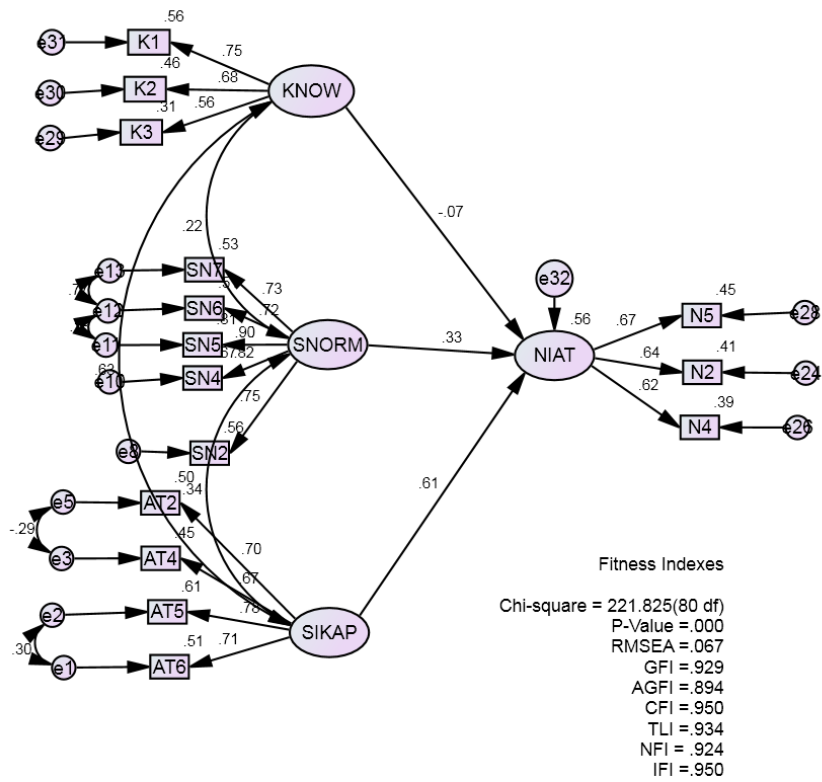


Figure 4: Model 2b

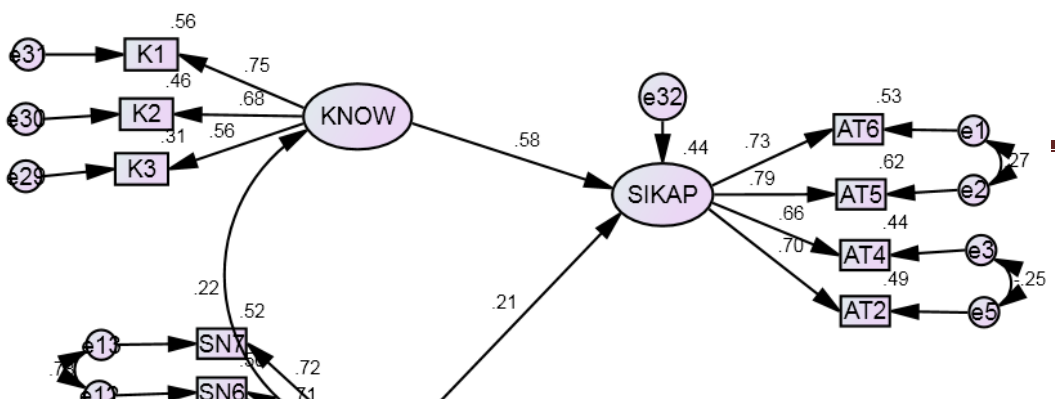
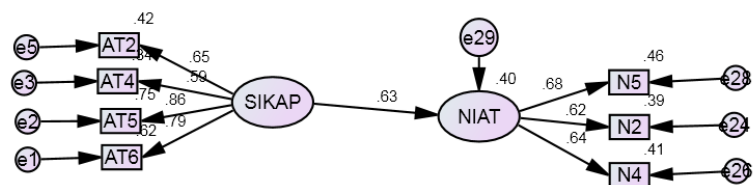


Figure 6: Model 2c



Fitness Indexes

Chi-square = 32.618(13 df)
P-Value = .002
RMSEA = .062
GFI = .977
AGFI = .951
CFI = .977
TLI = .963
NFI = .962
IFI = .977

Figure 7: Model 2d

