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Modelling the Consumer's Acceptance on Energy Efficient Products: Mediating Role of Attitude

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Abstract: The purpose of this study is to examine the acceptance of energy efficient products business in Malaysia as well as its impacts on the individual, society, environment and economy, providing a good example of setting up an effective national policies and paradigm. A total 392 usable questionnaires were analyzed by using Structural Equation Model with AMOS. By examining the model proposed, the study validated the important of consumers' attitude in mediating the linkage between consumers' perception on product advantages, subjective norm, responsibility and buying decision. However, the findings could not garner any support for mediating effect of attitude in the relationship between perceived behavior control negative and buying decision.

Key words: Energy efficient, acceptance, attitude, household appliances, Malaysia

INTRODUCTION

As all the countries in the rest of the world, Malaysia has experienced a challenging situation that is a social need for energy efficiency initiatives from ever increasing demand on energy from consumption and production activities (Shahnaei, 2012). Governments have come to realize that existing energy uses are unsustainable and that progress towards sustainability requires significant changes in the pattern of energy use by many sectors in the economy. To better solving on these emerging issues, the legislations and the management of energy framework in Malaysia have undergone a series of policies changes in order to meet the overall goal of environmental sustainability.

Previous studies on energy demand has shown that the pattern of energy demand by each sector has continues increasing by year. Changing consumption pattern and corresponding with the increasing per capita income, resulting in the increasing demand for energy at home especially for the use of electrical products such as refrigerators, dishwashers, microwave, washing machine and television set by the household in Malaysia.

USEPA said the household sector has a potential to reduce the energy consumption by 25-30% a year. Many studies (Chatterjee and Suresh, 2012; Mills and Schleich, 2010) support that the possible for energy user to reduce the energy use in building by changing to use for more energy efficiency products. The benefits of the products is not only reducing the household electrical cost but has a big contribution on reducing carbon dioxide (CO_2) which the end result to achieved better environment in the future.

Recent research has provided more insight into user acceptant of green product in general (Ramayah *et al*., 2010; Chen and Chai, 2010; Claudy, 2011) or more specifically for energy efficient products (Mills and Schleich, 2010; Chatterjee and Suresh, 2012). Marketers and policy makers are interested to explore the factors that motivate this type of environmental behavior, in order to utilize the knowledge in the design of their campaign and interventions. Researchers have thus developed models that serve as heuristic devices to explore particular types of environmental behavior and the factors that shape them. For example, the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), indicates that social behavior are motivated by individual attitude and subjective norms has been use in many environmental studies. This theory was then extended by Ajzen (1991) with additional factor of internal or external value by individual called as "perceived behavior control" in the

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Theory of planned Behavior (TPB). Many of the behavioral-based models, including Technology Acceptant Model (TAM) (Davis, 1989) also have been used to test in many context of consumer behavioral acceptant for product innovation and technology with the concern of attitude as one of the important determinant of individual behavior.

It appears that earlier environmental studies based on TRA, TPB and TAM have found significance behavioral characteristics of individual on individual behavior on environment. However, very limited empirical research on green buying behavior has been performed to examine and validate the explanatory factors based on composite model, especially in the context of energy efficiency products. Thus the main purpose of this study is to examine and confirm which factors is best for predicting consumer buying decision on energy efficient products. Specially, this study examines the effect of attitude as a mediating factor that linkage between consumer behavioral and buying decision.

Literature review: Attitude has received much attention within the context of behavioral model and environmental studies (Cheah and Phau, 2011). For example, the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975) suggests that the behavior of individual depends on a person's attitude to the products and his or her subjective norm. In this model, attitude appears as the main predictor and understood as a rational choice based evaluation of the outcomes of a behavior as well as an estimate of the likelihood of these outcomes. This understanding was then supported by study (Schultz and Zeleny, 2000) which explained attitudes on environment as a root in a person's concept of self and the degree to which an individual perceive himself to be an integral part of the natural environment. The Theory of Planned Behavior (TPB) which extended from TRA was account for the condition where individuals do not have complete control over their behavior. Thus in TPB, the behavior intention is determined by three factors which are stated as Attitude (ATT), Subjective Norms (SN) and Perceived Behavioral Control (PBC).

The important of attitude also been discussed in explaining individual acceptant on innovation and technology. Based on TRA, Davis (1989) developed the Technology Acceptant Model (TAM) which states that individual's technology or innovation usage is determined by Behavioral Intention (BI). Behavioral intention then is determined by his attitude toward the behavior, and this in turn is determined by two beliefs: perceived usefulness and perceived ease of use.

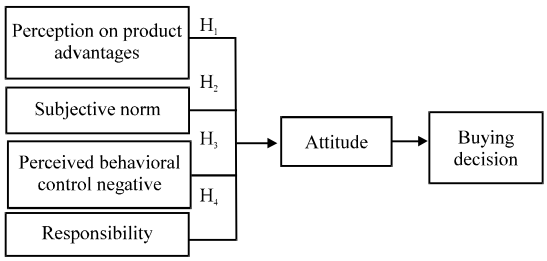

Fig. 1: Proposed research model

In general, there are numerous studies in the area of green behavior have tried to evaluates the role of attitude and many others consumers' motivations or perceived barriers for the acceptant of a products that have environmental characteristics. In regard to energy efficient products, study (Ha and Janda, 2012) found the important of attitude on consumer decision toward energy efficient products. With the used of theory of reasoned action, this study suggest that the important of attitude compared to subjective norm in motivate consumer buying behavior. Findings of this study also include the factor of consumer's perception about the product advantages which found positively related to the level of buying decision.

Iravani *et al*. (2012) arrives at similar findings, showing that the consumers' perception on product quality and benefits, social factor and attitude positive with buying behavior. Research by Mills and Schleich (2010) supports the above results on evaluating the acceptant of consumers' toward the EU labeling scheme in Europe. The study shows additional factors which the level of buying intention significant with socioeconomic factors such as education and economic incentives.

Based on the above discussion, Fig. 1 proposed research model for the study. In the context of this study on energy efficient products, attitude refers to general consumer feelings of favorable or unfavorable towards the use of energy efficient product. Moreover subjective norm refer to consumer perceptions regarding buying energy efficient by the opinions of the referent group such as friends and families. Perceived behavioral control negative describes consumers' perceptions of the difficulties in term of knowledge, resources and opportunities for buying energy efficient products. Perception on product advantages was based on perceived usefulness in TAM Model which defined in this study as the extent to which a person believes that using an energy efficient products would give an advantages to individual, societies and environment. The last factor of responsibility was added to the proposed model to test how a person feels responsible for buying

energy efficient as feelings of moral obligation for energy conservation. Based on discussion above and the important of attitude factor in influencing behavioral characteristics, study proposed the study hypotheses as follows:

- H_1: the relationship between consumers' perception on product advantages and buying decision is mediated by consumers' attitude on energy efficient products
- H_2: the relationship between subjective norm and buying decision is mediated by consumers' attitude on energy efficient products
- H_3: the relationship between consumers' perceived behavioral control negative and buying decision is mediated by consumers' attitude on energy efficient products
- H_4: the relationship between responsibility and buying decision is mediated by consumers' attitude on energy efficient products

MATERIALS AND METHODS

Data gathered using structured questionnaire from users and non-users of energy efficient products. Survey was conducted in the six urban areas in Malaysia, Kuala Lumpur, Putrajaya, Shah Alam, Kuantan, Kuala Terengganu dan Kota Baharu. These urban areas were chosen because their residents have more exposure for energy efficient products than those residents in the rural parts of Malaysia.

To fulfil the goal of obtaining the behavioral characteristics in explaining buying decision of consumers, the expert elicitation literature was reviewed. Table 1 shows the set of instrument used in this research. For all measures, a 6-point Likert scale was used with the anchors ranging from strongly disagree (1) to strongly agree (6). Initially, a total of 416 questionnaires were collected. After excluding some of questionnaires that were not completed, 392 usable data sets were entered for data analysis. From 392 respondents, 49% were male and 51% were female. The mean age of respondents was 41.3 years and most (69.6%) had married. In total 29% of respondents indicated their gross income was between RM1,501 and RM3,000. The distribution of highest educational level attained showed 35.5% had completed secondary school, 53% had completed a college or university degree and 8% had attained a master or doctoral degree.

Table 1: Results of CFA for measurement model

Construct and item	Factor loading	Cronbach alpha	CR	AVE
Perception on Product Advantages (PADV)		0.64	0.81	0.59
PA1	-α			
PA2	0.69			
PA3	0.84			
PA4	0.77			
Subjective Norm (SNORM)		0.79	0.86	0.56
SN1	-α			
SN2	0.74			
SN3	-α			
SN4	0.62			
SN5	0.91			
SN6	0.72			
SN7	0.73			
Perceived Behavior Control Negative (PBCN)		0.74	0.88	0.72
PBC1	0.84			
PBC2	0.87			
PBC3	0.83			
Responsibility (RESP)		0.71	0.79	0.56
R1	-α			
R2	0.72			
R3	-α			
R4	0.78			
R5	0.74			
Attitude (ATT)		0.77	0.81	0.52
AT1	-α			
AT2	0.74			
AT3	-α			
AT4	0.73			
AT5	0.72			
AT6	0.69			
Buying Decision (BD)		0.65	0.68	0.42
N1	0.62			
N2	0.64			
N3	0.68			

Composite Reliability (CR) = (square of the summation of the factor loading)/{(square of the summation of the factor loadings) + (summation of error variances)}. Average Variance Extracted (AVE) = (summation of the square of the factor loading)/ {(summation of the square of the factor loadings) + (summation of error variances)}

RESULTS AND DISCUSSION

To prove the proposed model's accuracy, the study follows Hair *et al.* (1996) and suggestion of a two-stage analysis which first the measurement model and then structural model test. Analyses were performed using AMOS 20. For a measurement quality, this study is based on the previous study in structural model (Iravani *et al.*, 2012) in testing construct validity, construct reliability and discriminant validity. Iravani *et al.* (2012) suggest that for a good model fit, there are some indicators have to achieved certain values such as the value of chi-square normalized by degrees of freedom (χ^2/df) should not exceed 3, Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Non-Normed Fit Index (NNFI) all should exceed 0.9 and Root Mean Squared Error (RMSEA) should not exceed 0.08.

Measurement model: The Confirmatory Factor Analysis (CFA) was used to examine the reliability and validity of the study measurement. The CFA result of the measurement model indicated a good fit to the data. The CFI estimate was 0.949, RMSEA estimate was 0.055, indicating that the fit is good because the RMSEA is the least affected by sample size (Hair *et al*., 1996). Similarly, the NFI estimate was 0.911 and p-value were 0.001 which further supports the adequacy of the measurement model.

As shown in Table 1, the reliability was assessed using the Composite Reliability (CR) value. All the CR values were above 0.68 indicating sufficient reliability of the measurement used. As suggested by previous literature (Iravani *et al*., 2012; Hair *et al*., 1996; Zainudin, 2012) if all factor loading exceed 0.6 and the Average Variance Extracted (AVE) for each construct exceeds 0.5 then we can conclude that convergent validity has been established. The internal reliabilities of the measures in this study were assessed using Cronbach's alpha coefficients. The result in Table 1 shows that the alpha values ranged from 0.64-0.79 which above the acceptable threshold.

Analysis on data validity suggested that satisfactory discriminant validity when the AVE of a particular construct is greater than the correlation shared by that particular construct with other construct in the model. Sharma (Hair *et al*., 1996) asserted that convergent discriminant is established when a diagonal elements (square root of the variance extracted) are greater than the off-diagonal elements (correlations among constructs). Refer to Table 2, we can conclude that the construct validity of the scale is high.

Structural model: To test the mediating effect of attitude for each of the variables (i.e., consumers' perception on product advantages, subjective norm, perceived behavioral control negative and responsibility), there are four steps or hierarchical in the data analyzing process based on Baron and Kenny (Sharma *et al*., 2005). Results presented in Table 3 shows that in first step of analysis (M1) three variables which is perception on product advantages (PADV: b = 0.59, p<0.001), subjective norm (SN: b = 0.29, p<0.001) and responsibility (RESP: b = 0.20, p<0.001) were found significantly related to the buying decision, whereas Perceived Behavior Control Negative (PBCN) shows not significant to buying decision. This multiple regression analysis shows that all the behavior characteristics variables accounted for about 68% (R^2 = 0.68) of the variance in buying behavior.

In step 2 (M2), it was found that PADV, SN and RESP are also significant related to mediator variable (attitude), hence met the first and second mediation procedure. Next in step 3 (M3) indicated a positive significant of mediator variable (attitude) with consumer buying behavior (ATT: b = 0.67, p<0.001). Final stages were tested the independent variable (PADV, SN and RESP) that significantly related with buying decision in step M1 and mediator (ATT) in M2 were tested on the dependent variable, buying decision (BD). It can be seen that these three variable (PADV, SN, RESP) was significantly related with the dependent variable (BD) and mediator (ATT) thus fulfilled the forth step requirement of Baron and Kenny's mediation test procedure.

The result of this analysis shows that attitude found to mediate the relationship between consumers' perception on product advantages, subjective norm and responsibility with consumers' buying decision. Thus the type of mediation for all these three variables called as partial mediation since the direct effect of independent variable on dependent variable is still significant after mediator entered the model. The value of R^2 indicates a significant mediating effect has increase model variance to 76% which means the model has better explanation with the attitude factor.

To further assess the significant of this mediation effect, Sobel (1982)'s test for indirect effect was used. The Sobel test result is summarized in Table 4. It confirmed that attitude has a significant mediating effect on the relationship between consumers' perception on product advantages and buying behavior. Thus, hypothesis 1 in

Table 2: Discriminant validity

Constructs	1	2	3	4	5	6
BD	0.68					
PADV	0.59	0.81				
SNORM	0.45	0.36	0.86			
PBCN	-0.05	-0.04	-0.25	0.88		
RESP	0.32	0.25	0.18	0.01	0.79	
ATT	0.50	0.33	0.33	-0.02	0.65	0.81

Diagonal element (in bold) are the square root of the Average Variance Extracted (AVE). Off-diagonal elements are the correlation among the constructs

Table 3: Hierarchical multiple regression results

	BD	ATT	BD	Mediation effect
	M1	M2	M3	M4
	X-Y	X-M	M - Y	X-M-Y
Constructs	B	B	B	B
PADV	0.59***	0.12**	-	0.51*
SN	0.29***	0.15**	-	0.19**
PBCN	-0.08	-0.05	-	-
RESP	0.20***	0.76***	-	-0.25***
ATT	-		0.67***	0.60***
R^2	0.68	0.72	0.45	0.76

**p<0.01 level (2-tailed)

Table 4: Sobel test result for the mediation effect of attitude on the relationship between behavioral characteristics and buying decision

Indirect effect	a	sa	b	sb	z
PADV-ATT-BD	0.12	0.045	0.50	0.124	2.22**
SNORM-ATT-BD	0.09	0.031	0.50	0.124	2.36***
RESP-ATT-BD	0.82	0.081	0.50	0.124	3.75***

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

this study is fully supported. Table 4 also indicated that relationship of the consumer buying decision with consumer subjective norm and responsibility were mediated by the attitude. Thus, this analysis was supported study's hypothesis 2 and 4.

CONCLUSION

The result of this study has some important implication for the knowledge and management practices. With the examination of factors suggested by the previous literature, the primary task for this section is to make sense of the hypotheses that were confirmed and give potential interpretations for those were not supported. Generally, this study propose that consumers' perception on product advantages, subjective norm, perceived behavior control negative and responsibility does influence consumer's decision and buying but it acts indirectly through mediating constructs that are closely linked to the products being purchased. This study result shows that three behavioral characteristics (perception on product advantages, subjective norm and responsibility) significantly relates with buying decision with attitude as a mediator variable. First given the consumers' perception on product advantages positively related to buying decision of energy efficient products. This finding are consistent with empirical study (Ha and Janda, 2012; Iravani *et al*., 2012; Hair *et al*., 1996; Zainudin, 2012; Sharma *et al*., 2005; Baron and Kenny, 1986) that found consumer perception on products and subjective norm were positively relates with buying decision. Findings also added value on attitude to partially mediate the relationship between perception on product advantages and buying decision. An obvious implication of this study is that consumer's perception on product is the important aspect in marketing innovation product. If the consumer believed that the energy efficient product is good for reducing energy cost and benefit societies as environment, thus this will give a positive attitude on product evaluation and then encourage them to purchase the product. This study has demonstrate that the significant of consumer perception about the product, therefore producers and marketers who wish to promote energy efficient product need to look in this factor to develop a good attitude of individual on buying green energy product. As social support such as family, peers and friends also plays an important role in influencing individual behavior and attitude. Therefore, it is very important to manufacturer to get consumers' trust and good experiences in using energy efficient products since a good recommendation is a crucial factor for a new user of energy efficient products in the future.

However, the findings could not garner any support for mediating effect of attitude in the relationship between Perceived Behavior Control Negative (PBCN) and buying decision. This shows that high consumer perceived behavior control negative may not necessarily lower the attitude of consumers toward energy efficient products. The direct effect of this factor also not significantly contributes to the consumer buying behavior. This means that in the context of purchasing energy efficient products and study sample the consumers' perceived behavior control was not the main resistant on buying this type of green products.

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