Sustainable Energy Consumption Behaviour:
An Empirical study to test the theory of planned behaviour

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ABSTRACT

The current patterns of consumption and behaviour worldwide are the main cause of environmental deterioration. As the environment continues to worsen, it has become a persistent public concern in the developed countries and has recently awakens developing countries to the green consumption movement. The study's hypothesis stated in two directions which direct and indirect relationship between subjective norm, perceived behaviour control, intention to buy and attitude as a mediating variable. The result shows that the relationship between subjective norm and consumer's intention is significant and positive. The study also found that the attitude work as a mediating factor between subjective norm and intention. The finding 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.

Key-words: consumers' attitude, subjective norm, sustainable energy consumption, intention.

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. Technological innovations have reduced the energy and material intensity of most products (Eban, 2008). However, the increasing volumes of consumed goods have outweighed these gains. Household energy consumption contributes to almost 30% to the total final energy consumption and is, after transport, the second most rapidly growing area of energy use. Household electricity consumption has continued to grow with the increasing per capita income, resulting in the ownership of household appliances like air-conditioners, refrigerators, dishwashers, microwave ovens, washing machines and radio and television sets. Another factor such as the changing role of women in society also becoming one of reason that influences the rising demand for electrical appliances. In the urban area, many women play a dual role as traditional housekeepers and wage earners to supplement the family income in order to cope with the rising cost of living. With limited time in hand, busy working women often rely on electrical gadgets to do some of their

household chores like cooking, washing and cleaning. Micro studies among rural and low-cost housing shows the similar trend.

The early studies 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_2), carbon monoxide (CO) and nitrogen oxide compounds (NO_x) (Li, 2011; Tan and Lau, 2009; Clas Eriksson, 2003). Energy sectors are responsible for approximately 65% of GHG emissions generated by human activities (IEA 2009). GHGs, mainly CO_2, 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 (Li, 2011). Scientists have warned that, once a certain threshold concentration of GHGs are reached, severe consequences such as catastrophic climate events and interrupted thermo circulation might lead to irreversibly large losses to human society and the earth's ecosystem (Ansar and Sparks, 2009).

These challenges call for policies that lead to higher energy efficiency and lower GHG emissions. An overview of the literature regarding domestic energy demand has found that an individual decision is very important in the context of sustainable consumption. Any energy consumption required an individual decision, and this is exactly the decision process in the centre of our interests, which we hopefully make more transparent.

What's Driving Sustainable Energy Consumption?

Based on the classic definition of the Brudtland Report (UNESCAP, 1987), sustainable consumption looking at how the goods and services required to meet basic needs and improve quality of life such as food and health, shelter, clothing, leisure and mobility can be delivered in ways that reduce the burden on the Earth's carrying capacity." The Oslo Symposium in 1994 proposed a working definition of sustainable consumption as

> *"the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations".*

Sustainable consumption is seen as a process involving negotiation and the building of consensus and in some areas this process competes with conventional market operations. This means that if new consumption strategies are to be achieved, all actors must be willing to engage in discourse. Hansen and Schrader, 1997 point out that the normative judgement of sustainable development and the corresponding sustainable consumption "has to be given additional legitimacy by a societal discourse" and practice (Hansen and Schrader, 1997: 455). Sustainable consumption has to be understood as a societal field of action, which could be characterised by three interacting areas of action which is individual (demand side), business (supply side) and governmental (socio-politic and governance). The three areas are interrelated. Finisterra et al. (2008) look at sustainable consumption as a more ecological but also socially such as way of buying and using goods and services. Individual and societal consumption behaviour is embedded in daily routines and influenced by a variety of contextual factors such as specific lifestyles, attitude, social environment (neighbourhood, favoured peer groups), systems of infrastructure, habits and routines (Shove, 2003).

Thus in this paper, we will test the model on consumer behavioural changes called as theory of Planned Behaviour (TPB) 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 this study intended to investigate the direct influence of subjective norm and perceived behavior control on consumer intention. Second, this study interested to investigate to what extent the consumer subjective norm and perceived behavior control – consumer intention behavior link is mediated by the consumer's attitude. The study framework shown in Figure 1.

Based on the gap literature, this study has derived the following research questions which will guide the research.
a. Does subjective norm and perceived behavior control have a direct relationship with consumer intention?
b. Does consumer intention mediate the relationship between consumer subjective norm and perceived behavior control and consumer intention?

Figure 1: Conceptual framework based on the Theory of Planned Behaviour
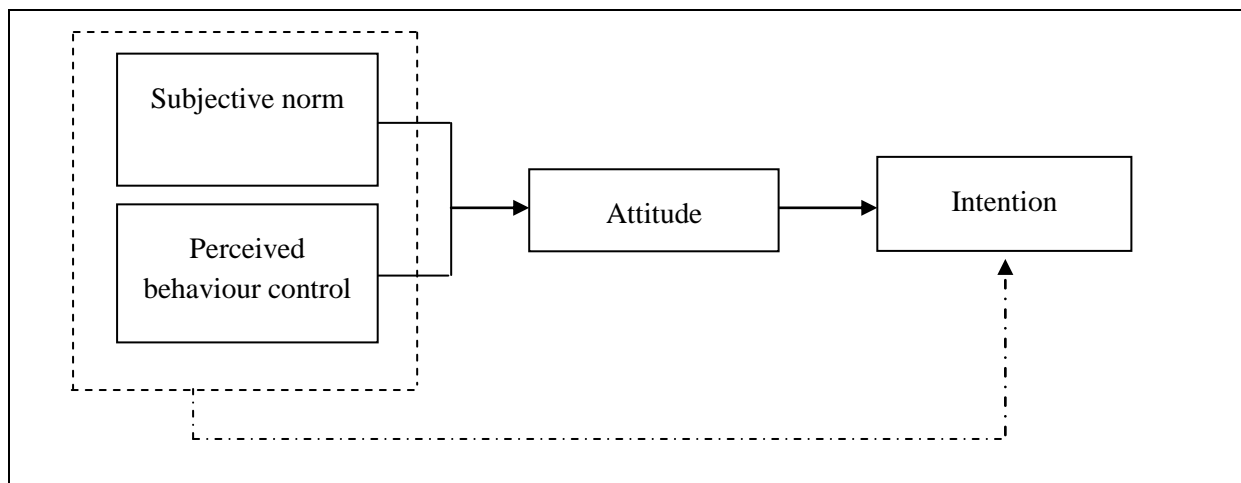
On the basis of the above framework, researcher proposed the following hypothesis:

Direct relationship:
Hypothesis 1: Subjective norm and perceived behaviour control are significantly related to the consumer' intention.

   Sub Hypothesis:
   H1a: There is a positive relationship between consumer's subjective norm and consumer' intention.
   H1b: There is a positive relationship between perceived behaviour control and consumer' intention.

Indirect relationship:
Hypothesis 2: Consumer's attitude mediates the relationships between subjective norm and perceived behaviour control and consumer' intention.

Sub Hypothesis:
H2a: Consumer's attitude mediates the relationships between consumer's subjective norm and consumer' intention.
H2b: Consumer's attitude mediates the relationships between perceived behaviour control and consumer' intention.

METHODOLOGY
Participants and procedure

A total of 500 hand-delivered surveys were distributed to consumers in six areas which is Kuala Terengganu, Kota Bharu, Kuantan, Shah Alam, Bangi and Putrajaya. In each case, the primary shopper was asked to fill out the survey instrument. 418 surveys were returned, representing a response rate of 83.6 per cent. Due to missing information and inadequate responses, a total of 392 usable questionnaires were obtained.

Participants were 192 males and 200 females with average in age are from 26 to 54 years with a mean age of 41.3 years. In terms of gender distribution, the proportion of women in our sample (51 per cent) was found to be higher than the corresponding proportion in the nationwide population. This is reflective of the Malaysian context where shopping on behalf of the household is still done more by women than by men. In total 29 percent of participants indicated that their gross income was "less than RM3,000, 25 percent "between RM3,001 and RM4,500", 14 percent "more than RM4,500 and RM6,000" and then 8 percent are more than RM9000 and above. The distribution of highest educational level attained showed 30.9 percent had completed high school, 53 percent had completed a college or university degree, and 8 percent had attained a master or doctoral degree.

Measures and analytical procedure

All constructs were measured via six-point Likert scales mainly because this type of scale has been shown to be robust in Malaysia cultural settings. Data analysis in this study was done in two parts. The first part involved a preliminary analysis on the demographic characteristics of the respondents, validity of measures, reliability of measures, data normality and the Pearson's correlation analysis. The second part of the data analysis involved the main study analysis which includes of the hierarchical multiple regression analysis testing the direct and mediating effect pertaining to the variables under this study. The data collected in this study was analysed using Statistical Package for Social Sciences (SPSS for Windows Version 22.0. prior to the testing the relationship between the variables measured, a confirmatory factor analysis (CFA) was conducted using analysis of moment structures (AMOS version 20). CFA allows the researcher specify both the number of factors that exist for a set of variables and which factor each variable will load on before results can be computed (Hair, et.al, 2010)

RESULTS
Reliability and Validity of Measurement

As shown in Figure 2, the CFA measurement model provided a good fit to the data. While the chi-square statistic was significant (p = 0.001), it is known to be highly sensitive to sample sizes (Joreskog,1993), so various alternative fit statistics were computed [e.g. the comparative fit index (CFI); the non-normed fit index (NNFI); and the root mean square error of approximation (RMSEA)]. Values in the mid-to high- 0.90 range indicate good fit for the

CFI and NNFI, and values of 0.80 and less indicate good fit for the RMSEA (Hu and Bentler, 1999). The CFI estimate was 0.946. The RMSEA estimate was 0.072, indicating that the fit is good because the RMSEA is the least affected by sample size (Sharma et al., 2005). Similarly, the NFI estimate was 0.922 which further supports the adequacy of the measurement model. The factor loading for constructs are ranged from 0.54 to 0.91. Reliability analysis of the study variable was established by testing whether the items grouped under a factor are internally consistent and stable. The internal reliabilities of the measures in this study were assessed using Cronbach's alpha coefficients. The result of the reliability test was presented in Table 1.

Table 1: Reliability coefficients for study variables after CFA

Variables	Number of items	Cronbach's Alpha
Intention	2	0.603
Attitude	4	0.768
Subjective norm	7	0.844
Perceived behaviour control	3	0.744

Figure 2: Measurement model
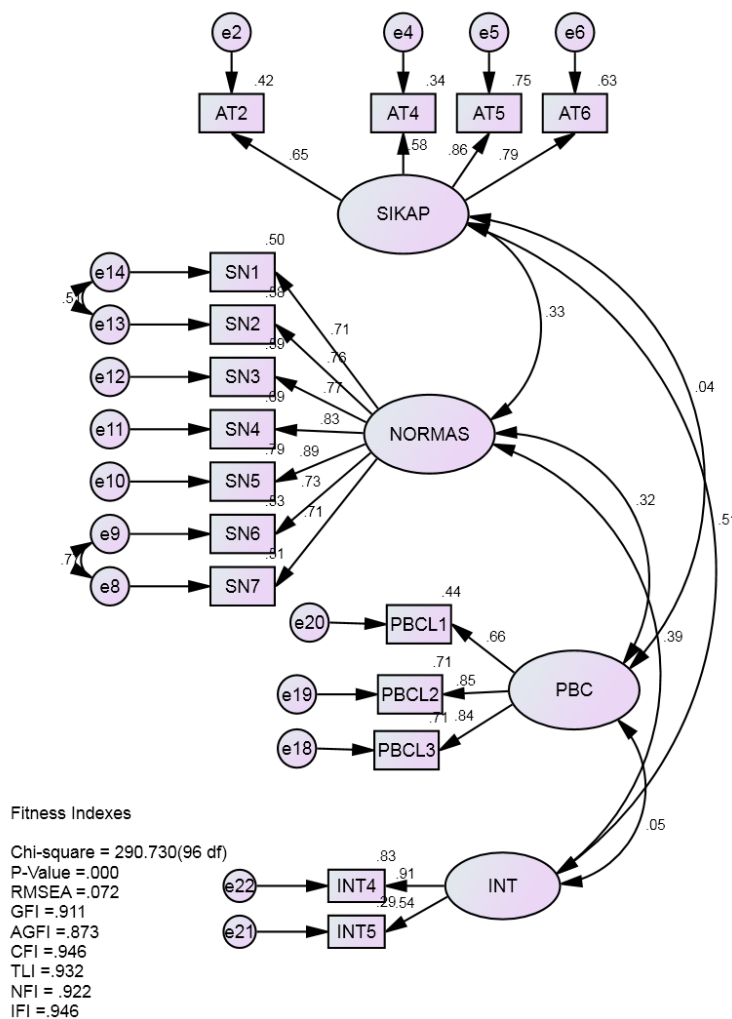
Descriptive statistic and Correlation

The bivariate relationship between all variables was investigated using Pearson product-moment correlation coefficient. Table 2 shows the value of means, standard deviations and correlations among the variables. The mean value for most of the study variables were above 3.5 except for the perceived behaviour control which is 3.10. The Pearson product-moment correlation analysis shows that most of the variables are strongly ad positively correlated with one another. Consumer's intention is found to be correlated positively and significantly with all variables as hypothesized. Attitude is also found to be correlated positively and significantly with subjective norm but not significantly with perceived behaviour control.

Table 2: Pearson Correlation Results

Variables	M	SD	1	2	3	4
1. Intention	4.74	0.79				
2. Attitude	4.71	0.94	.456**			
3. Subjective norm	3.96	1.21	.359**	.333**		
4. Perceived behaviour control	3.10	1.51	.131**	.019	.249**	

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

Multiple Regression

A hierarchical multiple regression was used to test hypothesis of this study. Table 3 shows the result of the hierarchical multiple regression that tested the direct effect of the independent variables which is subjective norm and perceived behaviour control on consumer's intention. Result shows that the total variance explained by the model as a whole was 12.6%. Subjective norm was found to be significantly predicted intention (b=0.348, $p < 0.001$) but perceived behaviour control was not significantly predicted intention (b =0.044, p = .365). Based on the above finding only sub hypothesis 1a is supported. Therefore hypothesis 1 of this study was partially supported.

Apart from the direct effects of subjective norm and perceived behaviour control on consumer intention (hypothesis 1), an additional analysis was carried out to predict the mediating effect of attitude in the relationship between subjective norm and perceived behaviour control and intention. Following the mediation procedures by Baron & Kenny (1986), hierarchical multiple regression was conducted to test the mediating effect of attitude in the relationship between subjective norm and perceived behaviour control with consumer intention. Then the results are presented in Table 4.

Table 3: Multiple regression result for the effect of subjective norm and perceived behaviour control on consumer's intention

Variables	Intention
	Step 1
	B
Subjective norm	0.348**
Perceived behaviour control	0.044
R2	0.130
Adjusted R2	0.126

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

In step 1a of the hierarchical multiple regression analysis (Table 4), subjective norm was found significantly related to the mediating variable attitude, whereas perceived behaviour control shows not significant to consumer's attitude. Thus sub hypothesis 2a is accepted. In step 1b, it was found that subjective norm is also significant related to dependent variable, hence met the first and second mediation procedure. In step 1c, the independent variable (subjective norm) that significantly related with intention in step 1b and mediator (attitude) was tested on the dependent variable (intention). 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. The result of this analysis shows that attitude found to mediate the relationship between consumer subjective norm and consumer's intention. Thus the type of mediation here 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 0.31 to 0.25.

Table 4: Multiple regression result for the effect attitude in mediating the relationship between subjective norm and perceived behaviour control on consumer's intention

Variables	Attitude	Intention	
	Step 1a	Step 1b	Step 1c
	B	B	B
Subjective norm	0.35**	0.31**	0.25**
Perceived behaviour control	-0.07	-0.08	
Attitude			0.44**

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

Table 5: Regression weights (direct effect)

	Estimate	*Std. regression weight*	*S.E.*	*C.R.*	*p*	*Result on hypothesis*
H1a:Intention ← SN	0.142	0.315	0.065	2.183	0.029 *	Accepted
H1b:Intention ← PBC	-0.036	-0.082	0.025	-1.471	0.001	Not Accepted

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

Table 6: Regression weights (indirect effect)

		Estimate	*Std. regression weight*	*S.E.*	*C.R.*	*p*	*Result on hypothesis*
H2a: Att	Intention	0.330	0.437	0.066	5.043	0.001	Accepted
H2b: SN	Intention	0.158	0.253	0.041	3.835	0.001	Accepted

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

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 theory of planned behaviour in two ways which is direct relationship between subjective norm and perceived behaviour control and intention. Then the theory was tested in indirect relationship with the mediating effect of attitude factor. From the structural modelling analysis, subjective norm and perceived behaviour control 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 finding 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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