Energy-Saving Behaviour in the Workplace

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Abstract

This study investigates the effect of attitude toward energy saving, perceived behaviour control, subjective norm, and perceived moral norm on energy saving-behaviour among non-academic staffs. This study based on theory of plan behaviour and normative activation theory. SEM-PLS is applied to analyse primary data. the result show that only one variable, perceived moral norm, has a significant effect on energy saving behaviour. This study contributes to the normative action theory. Practically, this study imply that university has to improve the perceived moral norm if it intent to increase an energy saving behaviour.

***Keywords:** perceived behavior, subjective norm*

1. Research background

Energy consumption plays an important role in the overall energy use in most countries. [1] argue that reduction of natural resources induced by human action has been the topic of discussion in contemporary community. In addition, it is also debated by consumers all over the world with the notion of environmental responsibility [1]. [2] state that environmental responsibility correspondingly emphasizes on role of community to hold for prescription of the ongoing environment crisis. Thus, it raises the issues of sustainable development as a priority in public debate [2]. Moreover, all level of society has been concerning the environment issue [3]. [4] add that there is a positive relationship between level of information held by consumers on environmental matters and their concern about adopting pro-environmental behaviour. One of the aspect of energy usage being currently discussed is energy consumption behaviour [5]–[7]. Governments worldwide have launched a variety of schemes to convey the energy conservation and promote them among individuals [8].

User behaviour is the key in explaining energy consumption. [9] define the energy consumption behaviour as total energy use of the occupant from both human and physical characteristic. Other scholar define an energy consumption behaviour as demand which serves the need and preferences of an individual in term of their energy use [10]. Energy consumption behaviour can be influenced by physical aspects, such as building characteristics, and the human variable, such as belief [9]. In addition, changes in human behaviour are perceived to be expected as technical efficiency is resulted from water-saving devices, home insulation, and energy-efficient appliances [11]. In fact, [12] argue that changing in energy consumption behaviour can contribute to solving the high energy consumption problem. Study about energy consumption behaviour has been done by several researchers [2], [5]–[8], [13]–[21].

[20] examined the effect of socio-demographic and psychological variable on energy savings in Netherland. further, [16] investigate the influence of energy cost on consumption behaviour among Qatari student living in UK. [15] examined the energy consuming behaviour in Qatar. [14] explored the determinants of individual's energy saving behaviour in China. [13] investigated homeowners' energy-saving behaviour in Bangkok, Thailand. [2] investigated the effect of environmental knowledge and attitudes on energy consumption among Portuguese students. [6] examined the motivations of consumers' energy consuming behaviour in South

Korea. [8] explored the critical determinants of individual energy-saving behaviour in China. [21] examines the connection between household environmental attitude and real energy consumption behaviour in USA. [5] studied the factors influencing residents' habitual energy-saving behaviours in China. [19] examine the factors affecting household electricity-saving-behaviour in China. [17] explore the mechanism of factors affecting urban household energy-saving behaviour in China. [18] study antecedents of employee electricity saving behaviour among workers in China. Finally, [7] analyse an individuals' energy consumption behaviour using energy big data in China.

Base on the previous researches, we conclude that most of studies were conducted in China [5], [7], [8], [14], [18], [19]. The research object of previous studies were household [5], [13], [17], [19], individual [14], [15], students [2], [16], and worker [18]. Based on theory used, previous studies applied the theory of plan behaviour [5], [6], [8], [14], theory of reason action [2], general model of perceived value [6], normative activation theory [5], [18]. Therefore, further investigation should be done in other countries, such as Indonesia. Besides, further research should also be conducted by using workers in the workplace since there is a limited previous studies using the workers and worker energy saving is different from household energy saving. Workers' energy consumption in organization is usually free of charge and they do not have to pay for it [18]. Free supply of energy increases the chance of energy wasting in organization [18]. Electricity is the main form of office employee energy consumption. Therefore, this study emphasizes on electricity consumption behaviour. This study aims to investigate the effect of attitudes toward energy saving, subjective norm, perceived behavioural control, personal moral norm on energy saving intention among non-academic staff employees. This paper is organised into four sessions. First session is discussed about background of the study. Second session consists of method and material. Third session is discussed about result and discussion. finally, this paper is closed by conclusion and recommendation.

2. Material and Methods

University's employee is research object. There are sixteen employee participating in this study. This study uses the primary data which is collected through online survey. There are two type of variables: latent dependent variable (energy saving behaviour) and latent independent variable (attitude toward energy saving, perceived behaviour control, subjective norm, and perceived moral norm). Energy saving behaviour's items are adapted from [5]. Items for All independent variables are adapted from [14]. All variables are measured by five scale Likert starting with strongly disagree (1) to strongly agree (2). This study applies SEM-PLS (smart-pls) to analyse the research data. there are two assessments of model when using the smart-pls [22]: measurement model and structural model assessment. Assessment measurement model consists of two validity test: convergent validity and discriminant validity test [23]. Meanwhile, structural model assessment is for hypothesis testing [24]. The research objective is answered by looking at path coefficient and p-value of latent independent variables.

3. Result and Discussion

Sixteen non-academic staff were participated in this study. Eleven of them is male (68.80%) and the rest is female (31.30%). Minimal and maximal age of respondent is 28 and 53 years old. Average age is 42 years old. Based on what unit the staff is assigned, eleven respondents (68.80%) are at faculty and the rest is in rectorate, labour and other unit. In addition, most of respondent has been working for eleven to twenty years (43.80%) and the rest is for one to ten years (25%), and twenty-one to thirty years (31.30%). With regard to education, most of respondent is graduated from bachelor (43.80%) and other are from senior high school (6.30%), diploma (18.80%), and master (31.30%). Table 1 provide us with measurement model assessment (convergent validity). There are four properties used to assess the convergent validity: outer loading, Cronbach's alpha, composite reliability and average variance extracted (AVE). The value of outer loading for all items are greater than 0.700 [25]. Items that do not

have value of outer loading above 0.700 were excluded, such as esb1, esb4, pbc3, and pmn2. Composite reliability (CR) and Cronbach's alpha (CA) are used to assess an indicator reliability and these value should not be less than 0.700 [26]. As seen in Table 1, all constructs have value of CA and CR above 0.700. Finally, the convergent validity is also supported by AVE and the value of AVE should be above 0.500 [26].

Table 1. Measurement Model Assessment   (Convergent Validity)

Construct	Item	Outer Loading	Cronbach's Alpha	Composite Reliability	Ave
attitude toward energy saving	ates1	0.933	0.944	0.960	0.857
	ates2	0.960			
	ates3	0.892			
	ates4	0.918			
energy saving behaviour	esb2	0.814	0.600	0.820	0.695
	esb3	0.849			
perceived behaviour control	pbc1	0.960	0.897	0.951	0.906
	pbc2	0.944			
perceived moral norm	pmn1	0.947	0.806	0.908	0.832
	pmn3	0.876			
subjective norm	sn1	0.919	0.922	0.951	0.865
	sn2	0.923			
	sn3	0.948			

Second assessment for validity is discriminate validity. Discriminant validly can be assessed by using Fornell-Lacker criterion [27]. Table 2 show the result of Fornell-Lacker criterion and the square root of a construct is greater than correlation a construct with other construct. For example, the value of square root for ATES (0.926) is greater than correlation ATES with ESB (0.566), PBC (0.829), PMN (0.705), and SN (0.736). other constructs also indicate the same thing. In addition, other assessment for discriminant validity is cross-loading. the result show that it is achieved discriminant validity requirement [28]. Therefore, the measurement model has an adequate discriminant validity.

Table 2. Measurement Model Assessment. (Discriminant validity-Fornell-Lacker Criterion)

Construct	ATES	ESB	PBC	PMN	SN
attitude toward energy saving behaviour (ATES)	0.926				
energy saving behaviour (ESB)	0.566	0.834			
perceived behavioural control (PBC)	0.829	0.431	0.946		
perceived moral norm (PMN)	0.705	0.847	0.633	0.913	
subjective norm (SN)	0.736	0.690	0.690	0.686	0.926

Table 3 provide us with result of structural model assessment. To see the fitness of model, there are two properties used here: predictive relevance (Q2) and predictive power (R2). The value of Q2 indicate that model has large predictive relevance [29]. In addition, the model also has a substantial predictive power [23]. Table 1 also show the result of effect of latent independent variables on latent dependent variable. Out of four latent independent variables being tested, only one latent independent variable (perceived moral norm) has a significant effect on energy saving behaviour. This result also can be seen in Figure 1.

Table 3. Assessment of Structural Model

Endogenous construct	Q²	decision	R²	decision
Energy saving behaviour	0.330	large	0.792	Substantial
Relationship	coef.	t stat	p value	Decision
attitude toward energy saving -> energy saving behavioural	-0.054	0.142	0.887	Unsupported
subjective norm -> energy saving behaviour	0.370	0.868	0.386	Unsupported
perceived behaviour control-> energy saving behaviour	-0.284	0.901	0.368	Unsupported
Perceived moral norm -> energy saving behaviour	0.809	2.222	0.027	Supported

Energy saving behaviour among non-academic staffs in this study is characterised by reducing the Air conditioners temperature when the room is already cool. Other characteristic is to power off the electric instrument when they are out for temporary. The reason why they are practicing the energy saving behaviour is regard to their moral obligation and feeling of unhappy. This finding is consistent with the previous study of [5].
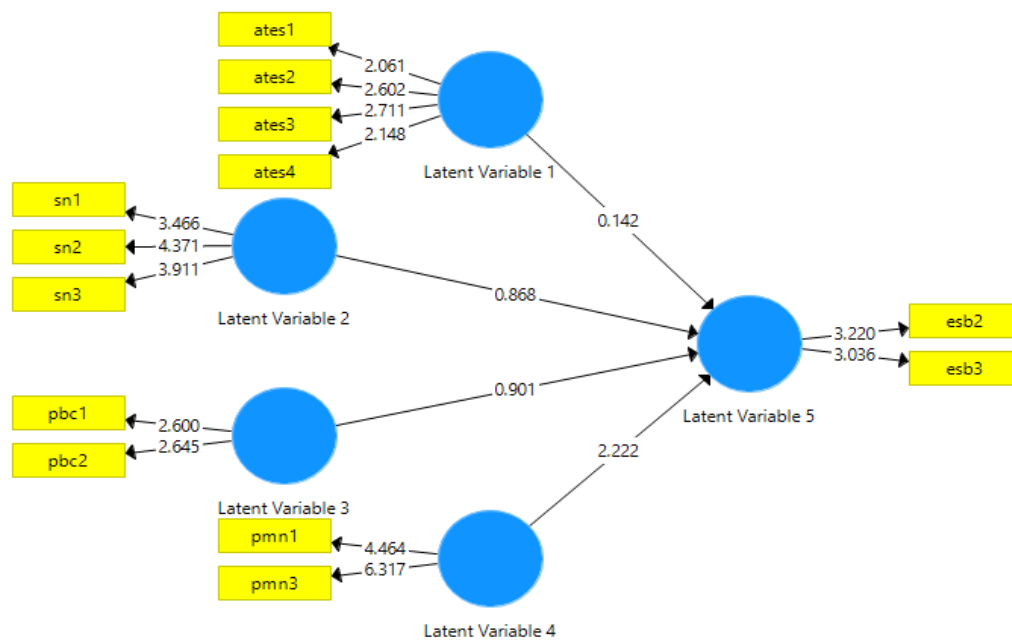

Figure 1. structural model

Note: latent variable 1: attitude toward energy saving, latent variable 2: subjective norm, latent variable 3: perceived behavioural control, latent variable 4: perceived behavioural control, latent variable 5: energy saving behaviour

4. Conclusion and Result

Energy saving behaviour is an important aspect of energy saving initiative. Pro-environment behaviour can reduce the environmental issue and increase the sustainable development. energy saving behaviour is not explored much by Indonesia's researchers. Therefore, this study investigates the effect of attitude toward energy saving, subjective norm, perceived behaviour control and perceived moral norm on energy saving behaviour. This study concludes that only one variable (perceived moral behaviour) has a significant relationship with energy saving

behaviour. Other variables do not have significant influence with energy saving behaviour. This study has theoretical implication on Normative Activation Theory (NAM). Practically, university management can increase the energy saving behaviour among non-academic staffs by increasing moral obligation and create the energy saving awareness among them. This study has several limitations. This study only uses sixteen respondents. Besides, this study applies TPB and NAM variables. future investigation should widen the number of respondents. In addition, future study also can apply other theory, such as social cognitive theory [30].

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