

Zulherman (3)

by Zulherman (3) Zulherman (3)

Submission date: 18-Apr-2024 09:41AM (UTC+0700)

Submission ID: 2353417566

File name: energy_3.pdf (401.03K)

Word count: 2904

Character count: 16623

Energy-Saving Behaviour in the Workplace

I Nengah Tela¹, Zulherman², Desi Ilona³, Zaitul^{4*}

^{1,2}Faculty of Planning & Civil Engineering, Universitas Bung Hatta, Padang, Indonesia

³Faculty of Economic, Universitas Putra Indonesia YPTK, Padang, Indonesia

⁴Faculty of Economic Universitas Bung Hatta, Padang, Indonesia

*zaitul@bunghatta.ac.id

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, [11] the 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 (5). 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 validity can be assessed 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	Q ²	decision	R ²	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].

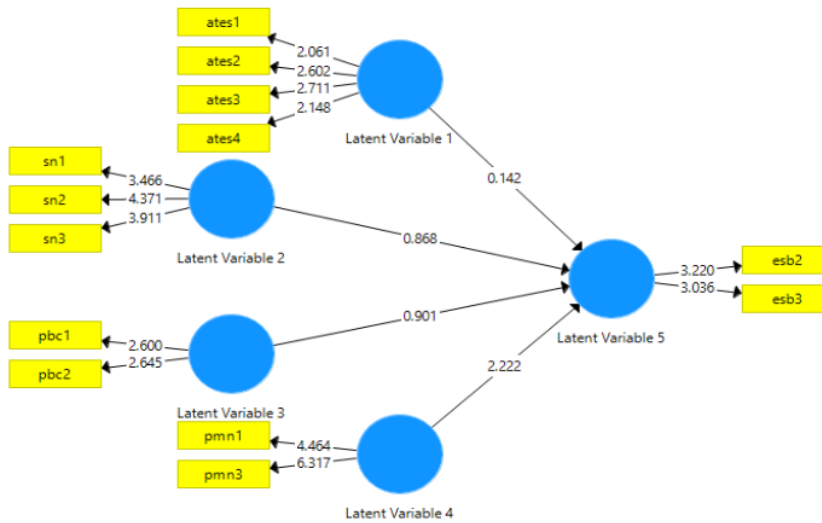


Figure 1. structural model

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].

References

- [1] M. C. Nisbet and T. Myers, "Twenty years of public opinion about global warming," *Public Opin. Q.*, vol. 71, no. 3, pp. 444–470, 2007.
- [2] A. Paço and T. Lavrador, "Environmental knowledge and attitudes and behaviours towards energy consumption," *J. Environ. Manage.*, vol. 197, pp. 384–392, 2017.
- [3] M. Chowdhury, K. Salam, and R. Tay, "Consumer Preferences and Policy Implications for the Green Car Market," *Mark. Intell. Plan.*, vol. 34, no. 6, pp. 810–827, 2016.
- [4] S. Misra and R. K. Panda, "Environmental consciousness and brand equity: An impact assessment using analytical hierarchy process (AHP)," *Mark. Intell. Plan.*, vol. 35, no. 1, pp. 40–61, 2017.
- [5] B. Wang, X. Wang, D. Guo, B. Zhang, and Z. Wang, "Analysis of factors influencing residents' habitual energy-saving behaviour based on NAM and TPB models : Egoism or altruism?," *Energy Policy*, vol. 116, pp. 68–77, 2018.
- [6] E. Park and S. J. Kwon, "What motivations drive sustainable energy-saving behavior?: An examination in South Korea," *Renew. Sustain. Energy Rev.*, vol. 79, pp. 494–502, 2017.
- [7] K. Zhou and S. Yang, "Understanding household energy consumption behavior : The contribution of energy big data analytics," *Renew. Sustain. Energy Rev.*, vol. 56, pp. 810–819, 2016.
- [8] X. Ru, S. Wang, and S. Yan, "Exploring the effects of normative factors and perceived behavioral control on individual's energy-saving intention : An empirical study in eastern China," *Resour. Conserv. Recycl.*, vol. 134, pp. 91–99, 2018.
- [9] M. H. Ishak, I. Sipan, M. Sapri, A. H. M. Iman, and D. Martin, "Estimating potential saving with energy consumption behaviour model in higher education institutions," *Sustain. Environ. Res.*, vol. 26, no. 2, pp. 268–273, 2016.
- [10] R. Wilk, "Consumption , human needs , and global environmental change," *Glob. Environ. Chang.*, vol. 12, pp. 5–13, 2002.
- [11] L. Steg and C. Vlek, "Encouraging pro-environmental behaviour : An integrative review and research agenda," *J. Environ. Psychol.*, vol. 29, pp. 309–317, 2009.
- [12] W. Abrahamse, L. Steg, C. Vlek, and T. Rothengatter, "A review of intervention studies aimed at household energy conservation," *J. Environ. Psychol.*, vol. 25, pp. 273–291, 2005.
- [13] D. Jareemit and B. Limmeechokchai, "Impact of homeowner ' s behaviours on residential energy consumption in Bangkok, Thailand," *J. Build. Eng.*, vol. 21, pp. 328–335, 2019.
- [14] L. Gao, S. Wang, J. Li, and H. Li, "Application of the extended theory of planned behavior to understand individual's energy saving behavior in workplaces," *Resour. Conserv. Recycl.*, vol. 127, pp. 107–113, 2017.
- [15] W. Al-marri, A. Al-habaibeh, and M. Watkins, "An investigation into domestic energy consumption behaviour and public awareness of renewable energy in Qatar," *Sustain. Cities Soc.*, vol. 41, pp. 639–646, 2018.
- [16] W. Al-marri, A. Al-habaibeh, and H. Abdo, "Exploring The Relationship Between Energy Cost and People ' s Consumption Behaviour," in *Energy Procedia*, 2017, vol. 105, pp. 3464–3470.
- [17] C. Zhang, B. Yu, J. Wang, and Y. Wei, "Impact Factors of Household Energy-Saving Behavior: An Empirical Study of Shandong Province in China," *J. Clean. Prod.*, vol. 185, pp. 285–298, 2018.
- [18] Y. Zhang, Z. Wang, and G. Zhou, "Antecedents of employee electricity saving behavior in organizations : An empirical study based on norm activation model," *Energy Policy*, vol. 62, pp. 1120–1127, 2013.
- [19] Z. Wang, B. Zhang, J. Yin, and Y. Zhang, "Determinants and policy implications for household electricity-saving behaviour : Evidence from Beijing , China," *Energy Policy*, vol. 39, pp. 3550–3557, 2011.
- [20] W. Abrahamse and L. Steg, "How do socio-demographic and psychological factors relate to households ' direct and indirect energy use and savings?," *J. Econ. Psychol.*, vol. 30, pp. 711–720, 2009.

- 1
- [21] Hishan, S. S., Khan, A., Ahmad, J., Hassan, Z. B., Zaman, K., & Qureshi, M. I. (2019). Access to clean technologies, energy, finance, and food: environmental sustainability agenda and its implications on Sub-Saharan African countries. *Environmental Science and Pollution Research*, 26(16), 16503-16518.
- 20
- [22] J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A primer on partial least squares structural equation modeling (PLS-SEM)*. Los Angeles: SAGE Publication, 2017.
- 29
- [23] J. Hair, M. Sarstedt, L. Hopkins, and V. G. Kuppelwieser, "Partial least squares structural equation modeling (PLS-SEM)-An Emerging Tool in Business Resarch," *Eur. Bus. Rev.*, 2014.
- [24] V. E. Vinzi, W. W. Chin, J. Henseler, and H. Wang, *Handbook of Partial Least Square: Concepts, Methods and Applications*. Berlin, German: Springer, 2010.
- 16
- [25] J. Hulland, "Use of partial least square (PLS) in strategic management research: a review of four recent studies," *Strateg. Manag. J.*, vol. 20, pp. 195-204, 1999.
- 18
- [26] R. R. Bagozzi and Y. Yi, "On the Evaluation of Structural Equation Models," *J. Acad. Mark. Sci.*, vol. 16, no. 1, pp. 74-94, 1988.
- 25
- [27] C. Fornell and D. F. Larcker, "Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics," *J. Mark. Res.*, vol. 18, no. 3, p. 382, 1981.
- 6
- [28] J. Henseler, C. M. Ringle, and M. Sarstedt, "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *J. Acad. Mark. Sci.*, vol. 43, pp. 115-135, 2015.
- 19
- [29] J. Henseler, C. M. Ringle, and R. R. Sinkovics, "The use of partial least squares path modeling in international in international marketing," *Adv. Int. Mark.*, vol. 20, pp. 277-319, 2009.
- [30] A. Bandura, *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall, 1986.

Zulherman (3)

ORIGINALITY REPORT

23%

SIMILARITY INDEX

%

INTERNET SOURCES

19%

PUBLICATIONS

18%

STUDENT PAPERS

PRIMARY SOURCES

- 1** Submitted to Liverpool John Moores University
Student Paper 1%
 - 2** Ali Ghofrani, Esmat Zaidan, Ammar Abulibdeh. "Simulation and impact analysis of behavioral and socioeconomic dimensions of energy consumption", Energy, 2021
Publication 1%
 - 3** Submitted to Syntax Corporation
Student Paper 1%
 - 4** Aondoyila Kuhe, Danladi Yusufu Bisu. "Influence of situational factors on household's energy consumption behaviour", International Journal of Energy Sector Management, 2019
Publication 1%
 - 5** Qipeng Chen, Zhong Fan, Dritan Kaleshi, Simon Armour. "Rule Induction-Based Knowledge Discovery for Energy Efficiency", IEEE Access, 2015
Publication 1%
-

6	Submitted to Queen Mary and Westfield College Student Paper	1 %
7	Sunday O. Oyedepo, Emmanuel G. Anifowose, Elizabeth O. Obembe, Shoaib Khanmohamadi. "Energy-saving strategies on university campus buildings: Covenant University as case study", Elsevier BV, 2021 Publication	1 %
8	Submitted to Universitas Mulawarman Student Paper	1 %
9	Xiang Li, Dan Shi, Yongjian Li, Xueping Zhen. "Impact of Carbon Regulations on the Supply Chain With Carbon Reduction Effort", IEEE Transactions on Systems, Man, and Cybernetics: Systems, 2019 Publication	1 %
10	Wasin Pirom, Anuchart Srisiriwat. "Electrical Energy-Based Hydrogen Production via PEM Water Electrolysis for Sustainable Energy", 2022 International Electrical Engineering Congress (iEECON), 2022 Publication	1 %
11	Submitted to Altinbas University Student Paper	1 %
12	Jian Zuo, Raufdeen Rameezdeen, Matthew Hagger, Zhihua Zhou, Zhikun Ding. "Dust	1 %

pollution control on construction sites: Awareness and self-responsibility of managers", Journal of Cleaner Production, 2017

Publication

13

Suhaib Arogundade, Mohammed Dulaimi, Saheed Ajayi, Abdullahi Saka, Olusegun Ilori. "Decarbonization of construction projects: a review and interpretive structural modelling of carbon reduction drivers", Journal of Engineering, Design and Technology, 2023

Publication

14

Submitted to Grenoble Ecole Management

Student Paper

15

"Household Energy Saving in China: The Challenge of Changing Behaviour", SpringerBriefs in Environment Security Development and Peace, 2016.

Publication

16

Submitted to Technical University Delft

Student Paper

17

Submitted to The Hong Kong Institute of Education

Student Paper

18

F. Langerak, E.J. Hultink. "The Impact of New Product Development Acceleration Approaches on Speed and Profitability:

1 %

1 %

1 %

1 %

1 %

1 %

Lessons for Pioneers and Fast Followers",
IEEE Transactions on Engineering
Management, 2005

Publication

19

Submitted to University of Glamorgan

Student Paper

1 %

20

Submitted to Mindanao State University - IIT

Student Paper

1 %

21

Kaile Zhou, Changhui Yang, Jianxin Shen.

"Discovering residential electricity
consumption patterns through smart-meter
data mining: A case study from China",
Utilities Policy, 2017

Publication

1 %

22

Ridayani, N Saputra, N Siagian, R A S Owon, I

Rawadhy. "The correlation of environmental
education, environmental knowledge,
environmental involvement, and waste
management behavior", IOP Conference

Series: Earth and Environmental Science, 2022

Publication

1 %

23

Matthew C. Nisbet. "Communicating Climate
Change: Why Frames Matter for Public
Engagement", Environment: Science and
Policy for Sustainable Development, 2009

Publication

1 %

24

Submitted to University of San Diego

Student Paper

1 %

25

Okazaki, S.. "What is SMS advertising and why do multinationals adopt it? Answers from an empirical study in European markets", Journal of Business Research, 200801

Publication

1 %

26

Submitted to University Tun Hussein Onn Malaysia

Student Paper

1 %

27

Wadha Al-Marri, Amin Al-Habaibeh, Hafez Abdo. "Exploring the Relationship between Energy Cost and People's Consumption Behaviour", Energy Procedia, 2017

Publication

<1 %

28

Hun Chong Tan, Ding Hooi Ting, Tomomi Sudo. "Measuring Individual Pro-Environmental Behavior Transformation: Contextualizing Individual Learning Behavior", KnE Social Sciences, 2023

Publication

<1 %

29

Submitted to Hungarian University of Agriculture and Life Sciences

Student Paper

<1 %

30

Submitted to Tilburg University

Student Paper

<1 %

"Abstracts", Fuel and Energy Abstracts, 2019

31

Publication

<1 %

32

O. Kwon, K. Choi, M. Kim. "User acceptance of context-aware services: self-efficacy, user innovativeness and perceived sensitivity on contextual pressure", Behaviour & Information Technology, 2007

Publication

<1 %

33

Tereza Navratilova. "Analysis and Comparison of Factors Influencing University Choice", Journal of Competitiveness, 2013

Publication

<1 %

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off