Antecedents of Workplace Energy Saving Behaviour: An Integration of the Theory of Planned Behaviour and Norm Activation Model

Olawale Fatoki*

Department of Business Management, University of Limpopo, Private Bag X1314, Sovenga, 0727, South Africa.
*Email: olawale.fatoki@ul.ac.za

ABSTRACT

Hotels are energy intensive facilities and have contributed to environmental problems such as high consumption of natural resources, high emissions of carbon dioxide and waste pollution. Therefore, it is important to understand the factors that can reduce energy (electricity) consumption in hotels. The study examined the antecedents of employee energy saving behaviour in hotels by integrating the theory of planned behaviour (TPB) and the norm activation model (NAM). Data was collected from the respondents through the cross-sectional survey method. The partial least square structural equation modelling (PLS SEM) was used to analyse data and test the hypotheses. The results indicated that two TPB constructs (attitude and perceived behavioural control) are significantly positively related to energy saving intention. In addition, three NAM constructs (awareness of consequences, ascription of responsibility and personal norms) are significantly positively related to energy saving intention. Energy saving behaviour is influenced by intention. Recommendations focus on awareness about the negative effects of energy consumption on the environment through education and training.

Keywords: Employees, Hotels, Energy Saving Behaviour, Theory of Planned Behaviour, Norm Activation Model
JEL Classifications: M10, M11

1. INTRODUCTION

Energy plays a significant role in human lives and in the socio-economic development of countries. Energy consumption per capita is one of the significant indicators of economic development (Esen and Bayrak, 2017). In recent times, energy consumption has significantly increased in many countries due to population growth, urbanisation and increasing levels of industrialisation (Alshami and Sabah, 2019).The most widely used energy sources for the generation of electricity in many countries are fossil fuels especially coal, oil and natural gas (Yildiz, 2018). Although the production and use of environmentally friendly renewable sources have increased, fossil fuels are still of vital importance in meeting global energy needs (International Energy Agency, 2021). Coal dominates South Africa's energy resource base and

approximately 77% of the energy needs of the country are powered by coal (Department of Mineral Resources and Energy, 2021).The burning of fossil fuel to generate energy releases stored carbon and other greenhouses gases into the atmosphere (United States Environmental Protection Agency, 2022). An excess amount of greenhouse gases in the atmosphere is one of the major causes of air and water pollution and global warming (Martins et al., 2019).

One of the fastest, cheapest and safest ways to mitigate climate change is to improve energy efficiency and reduce energy use especially electricity demand (Sorrell, 2015). Energy-saving behaviours are pro-environment behaviours that help reduce the use of fossil fuels and mitigate climate change (Hussain et al., 2021). Energy-saving behaviours can be described as practices that reduce energy consumption (Maqbool and Haider, 2021).

Energy saving behaviour can be divided into purchasing energy saving behaviour (energy efficiency) and habitual or daily energy saving behaviour (Azizi et al., 2019). Purchasing energy saving behaviour focuses on the use of energy efficient equipment or new technologies without changing lifestyles to reduce energy use (Karlin et al., 2014). Habitual energy saving behaviour centres on changes to certain habits or adjustments to certain behaviours to reduce energy use (Wang et al., 2018). Despite the significance of energy efficiency, changes in human behaviour are important because gains related to technical efficiency from energy efficient appliances tend to be overtaken by consumption growth (Steg and Vlek, 2009; Wang et al., 2018). Energy conservation such as turning down heating, using less air-conditioning, reducing commuting by working from home, car-pooling or using public transport can significantly help to reduce energy use, reduce cost of electricity to individuals and businesses, reduce energy dependence and ensure energy security (Sorell, 2015; International Energy Agency, 2022). Climate change is largely anthropogenic and the occupants of buildings can make a significant reduction to energy consumption through behavioural change (Paone and Bacher, 2018; Lynas et al., 2021). Energy saving behaviour by individuals in the workplace is a major factor in reducing overall energy use (Leygue et al., 2017). The main form of energy consumption by employees at work is electricity (Zhang et al., 2014). Therefore, it is important to understand the determinants of employee energy (electricity) saving behaviour in the workplace (Carrus et al., 2021).

The theoretical frameworks for explaining individual pro-environmental behaviour include the Theory of Planned Behaviour (TPB), the Norm Activation model (NAM) and the Value Belief Norm theory (VBN) (Schwartz and Howard, 1981; Ajzen, 1991; Stern, 2000). This is because the two major approaches to predict individual pro-environmental behaviour are self-interest motives and pro-social motives (Shin et al., 2018). Self-interest motives suggest that individual engage in pro-environmental behaviour because of personal interest (such as developing a favourable attitude towards pro-environmental behaviour. Self-interest motives can be linked to attitudinal theories such as the Theory of Reasoned Action (TRA) and the TPB (Fishbein and Ajzen, 1977; Ajzen, 1991). Pro-social motives are linked to moral considerations in pro-environmental behaviour and can be explained by the NAM and VBN (Schwartz and Howard, 1981; Stern, 2000). Both the TPB and the NAM have been used separately to explain individual pro-environmental behaviour (der Werff and Steg, 2015; Du and Pan, 2021). However, pro-environmental behaviour by individuals is usually a mixture of self-interest motives ad pro-social concerns (Budovska et al., 2020). In addition, the use of an integrated model addresses the shortcomings of using a single theory to explain pro-environmental behaviour (Liu et al., 2017). While the NAM is more internal and argues that individual pro-environmental behaviour is derived from personal norms, the TPB is more external with the individual taking into consideration the external factors such as subjective norms (Wang et al., 2018).

The aim of the study is to predict energy saving behaviour of hotel employees by integrating the TPB and the NAM. The study will be significant in the following ways. First, current efforts to reduce energy use in workplaces have primarily focused on appliances, system efficiency and improvement of physical infrastructure. However, investigations that focus on employees with no energy responsibilities save are sparse (Leygue et al., 2017). Second, studies have integrated the TPB and the NAM into a single model for predicting employee energy saving behaviour in the context of firms in developing countries are scarce (Hien and Chi, 2020). Third, understanding the antecedents of energy conservation in the workplace will help to reduce energy use, increase energy security and positively contribute to the achievement of net zero emission target (United Nations Climate Change Conference, 2021).

2. LITERATURE REVIEW

2.1. TPB and NAM
The TPB is a psychological theory that links beliefs to behaviour and was developed to improve the predictive power of the TRA. According to the TRA by Fishbein and Ajzen (1975), the intention to perform a behaviour is dependent on a positive evaluation of the behaviour (attitude) and the belief that significant others want the individual to perform the behaviour (subjective norms). Intention is associated with actual behaviour (Fishbein and Ajzen, 1975). The TPB by Ajzen (1991) proposes that the intention to perform a behaviour is shaped by three factors namely attitude, subjective norms and perceived behavioural control (PBC). Therefore, in developing the TPB, Ajzen added PBC (the degree to which an individual is of the belief that he/she can perform a behaviour) to the two constructs of the TRA. The TPB has been used as the theoretical foundation for studies on pro-environmental behaviour and energy conservation behaviour (Leeuw et al., 2015; Yadav and Pathak, 2017; Macovei, 2015; Canova and Manganelli, 2020). Although the TPB has demonstrated its usefulness in predicting behaviour, its use is limited for some behaviours and contexts. Ajzen (1991) argues that the TPB is open to the addition of new constructs provided they can improve the explanatory power of the theory. Human behaviours are complex and their prediction through the three TPB constructs may be impossible. Therefore, it is necessary to employ other behavioural models to predict some behaviours especially pro-environmental behaviour that is not only based on rational decision-making but also moral obligations (Esfandiar et al., 2019; Sang et al., 2020).

The norm activation model (NAM) by Schwartz (1977) proposes a sequential model that links awareness of consequences to ascription of responsibility, personal norms and prosocial intention or behaviour. Awareness of consequences describes an individual's perception of the severity of his/her behaviour on the welfare of other people. Ascription of responsibility refers to the feeling of responsibility for the negative consequences that can occur from an individual's failure to act. Personal norms describe a sense of moral obligation to abstain from or engage in certain behaviour. The NAM has been used as the theoretical foundation of studies on pro-environmental behaviour and energy conservation behaviour (der Werff and Steg, 2015; Fang et al., 2019; Li et al., 2019).

The TPB is a rational selection model that ignores the effects of irrational and altruistic motives and cannot fully explain pro-environmental behaviour (Zhang et al., 2017) The NAM does

not take into consideration the variables of the rational choice model and does not fully describe the factors that can affect pro-environmental behaviour (Han, 2015). Therefore, the integration of the TPB and NAM in the context of pro-environmental behaviour takes into consideration individual self-interested and rational motives and belief based on norms and morality (Shi et al., 2017; Li et al., 2019; Sang et al., 2020).

2.2. Hypotheses

2.2.1. TPB and employee energy saving intention

Yadak and Pathak (2017) used the TPB to investigate consumer green purchasing intention and behaviour in India. The findings of the study indicate that the three constructs of the TPB are positively related to intention to purchase green products. Setyawan et al. (2018) used the TPB as the theoretical framework to examine young consumers' intention to purchase green products. The findings indicate that attitude does not significantly affect intention, however, the effects of subjective norms and perceived behavioural control are significant. In the context of energy saving behaviour, Macovei (2015) finds that attitude has a significant positive relationship with intention to conserve energy. However, the effects of subjective norms and perceived behavioural control on intention are insignificant. The findings of the study by Liu et al. (2020) indicate that attitude is the most significant factor in household energy conservation intention. The effect of perceived behavioural control is also significant. However, the relationship between subjective norms and intention is insignificant. Canova and Manganelli (2020) find that the three TPB constructs are positively related to intention to conserve energy at work. Dixon et al. (2015) find that attitude, subjective norms (injunctive and descriptive) and perceived behavioural control are significantly positively related to intention to conserve energy at work. The findings of the study by Chen and Chen (2021) show that that attitude and perceived behavioural control are positively correlated to employee energy conservation habit. The effect of subjective norm is insignificant. Based on the TPB, the following hypotheses are developed.

H_1: Attitude towards energy saving and employee energy saving behaviour are significantly positively related.

H_2: Subjective norms and employee energy saving behaviour are significantly positively related.

H_3: Perceived behavioural control and employee energy saving behaviour are significantly positively related.

2.2.2. NAM and energy saving intention

2.2.2.1. Awareness of consequences

Zhang et al. (2013) find that awareness of consequences is positively related to ascription of responsibility in the context of electricity saving. The findings of the study by Setiawan et al. (2021) indicate that awareness of consequences has a significant positive relationship with personal norms. Awareness of consequences towards bin use has a positive effect on personal norms toward binning behaviour (Esfandiar et al., 2020). Wan et al. (2014) in a study that integrated the TPB and NAM to predict recycling intention in Hong Kong point out that a high level of awareness of consequences will increase the intention to perform recycling of waste. The study by Wan et al. (2014) finds that awareness of consequences has a significant positive

relationship with recycling intention. Fang et al. (2019) used the NAM to investigate the pro-environmental behaviour of public servants in Taiwan. The findings indicate that awareness of consequences positively affects employee pro-environmental behaviour. Dalvi-Esfahani et al. (2017) in a study that used NAM to investigate the adoption of green information systems find that awareness of adverse consequences of environmental conditions positively affects the intention to adopt green information systems. In addition, awareness of consequences and ascription of responsibility are significantly positively related. Zhang et al. (2013) remark that the consumption of electricity leads to energy insecurity and environmental problems. If employees are aware of these negative effects, they are likely to develop feelings of moral obligation to save electricity. Therefore, awareness of consequences can positively influence employee energy saving behaviour at work.

De Grrot and Steg (2009) and Onwezen et al. (2013) remark that studies on NAM have used personal norms either as a mediator or a moderator In a mediation model, it is assumed that awareness of consequences affects personal norms through ascription of responsibility. In a moderation model, the effect of personal norms on behaviour is moderated by awareness of consequences and ascription of responsibility. De Groot and Steg (2009) compared five studies on the moderating and mediating effects of personal norms and find a strong evidence that NAM is a mediating model. The findings by De Groot and Steg (2009) reveal that a person must be aware of consequences of a behaviour before developing responsibility for it. Thus, the feelings of responsibility trigger personal norms, which then encourage individual behaviour. The findings of the study by Onwezen et al. (2013) show that awareness of consequences positively influences ascription of responsibility and this in turn affects personal norms. Dalvi-Esfahani et al. (2017) find that the relationship between awareness of consequences of adverse environmental condition and intention to adopt green information system is partially mediated by personal norms. Wang et al. (2016) in a study on the intention to recycle e-waste in China find that both awareness of consequences and ascription of responsibility activate personal norms which in turn positively affect the recycling intention of residents. It is hypothesised that:

H_4: Awareness of consequences is significantly positively related to ascription of responsibility.

H_5: Awareness of consequences is significantly positively related to personal norms.

H_6: Awareness of consequences is significantly positively related to intention.

H_7: The relationship between awareness of consequences and personal norms is mediated by ascription of responsibility

H_8: The relationship between awareness of consequences and intention is mediated by personal norms.

2.2.2.2. Ascription of responsibility

Ascription of responsibility reflects the feeling of responsibility by an individual of the adverse effects of not acting and is one of the factors that can influence pro-environmental behaviour (Steg and de Groot, 2010). Xu et al. (2020) examine the effect of ascription of responsibility on intention to save energy at work. Ascription of responsibility is particularly important in the

workplace because occupants in the office obtain no financial benefits for saving energy and so tend to see the responsibility to save energy as that of their organisation and not their own. This lack of responsibility may negatively influence the need to change behaviour. The study finds that ascription of responsibility positively affects employee energy saving behaviour at work. The findings of the study by Shin et al. (2018) indicate a significant positive relationship between ascription of responsibility and personal norm. Han (2015) in a study on the pro-environmental behaviour of travellers in the green context finds that ascription of responsibility is positively related to the sense of obligation to take pro-environmental action. Zhang et al. (2013) remark that when employees have ascription of responsibility especially responsibility for the negative consequences of electricity use, this is likely to trigger personal norm about electricity saving in a firm. The study finds a significant personal relation between ascription of responsibility and personal norm. Mamun et al. (2022) in a study on the energy conservation behaviour of Malaysian youth find that ascription of responsibility positively affects personal norm. It is hypothesised that:

H_9: Ascription of responsibility is significantly positively related to personal norms.

H_{10}: Ascription of responsibility is significantly positively related to intention.

H_{11}: The relationship between ascription of responsibility and intention is mediated by personal norms.

2.2.2.3. Personal norms
Personal norms have a positive influence on pro-environmental intention and behaviour because it describes the feelings of moral obligations to do the appropriate thing (Wang et al., 2019; de Groot et al., 2021). Wang et al. (2016) find that personal norms are positively related to the intention to adopt hybrid electric vehicles in China. Zhang et al. (2013) remark that in the context of electricity saving in a firm, personal norms refer to an employee's moral obligation to save electricity. The study finds that personal norms is positively related to energy saving behaviour. Wang et al. (2018) find that personal norms positively affect urban residents' energy saving behaviour. Hien and Chi (2020) remark that individuals with high levels of personal normss will have the feeling of responsibility to save energy. The study finds that personal norms significantly influence household electricity saving intention. The findings of the study by Wang et al. (2019) show a significant positive relationship between personal norms and employee workplace energy saving behaviour. It is hypothesised that:

H_{12}: Personal norms and employee energy saving intention are significantly positively related.

2.2.2.4. Intention and energy saving behaviour
Intention is the antecedent of behaviour (Ajzen, 1991). Yadak and Pathak (2017) used the TPB to investigate consumer green purchasing intention and behaviour in India. The findings of the study indicate that intention has a significant positive relationship with green purchase behaviour. Gkargkavouzi et al. (2019) in a study that focused on environmental behaviour in the private sphere context find that behavioural intention positively affects the performance of the behaviour. Macovei (2015) and Mamun et al.

(2022) find that intention to conserve energy positively affects energy conservation behaviour. It is hypothesised that:

H_{13}: Intention to save energy is positively related to employee energy saving behaviour.

Figure 1 depicts the conceptual model of the study.

3. RESEARCH METHODOLOGY

The study employed the cross-sectional survey method to collect data from hotel employees. According to Cingoski and Petrevska (2018), hotels are generally energy intensive facilities with associated high energy costs and are ranked amongst the top five with respect to energy consumption in the tertiary building sector. Data was collected with the assistance of a data collection agency from hotel employees in the Johannesburg, Pretoria and Polokwane in the Gauteng and Limpopo Provinces of South Africa. The permissions of both the participation hotels and their employees were sought and a pilot study was conducted before actual data collection to improve face and content validity.

The self-administered questionnaire method was used to collect data from the respondents who were assured of anonymity and confidentiality. The questions were adopted from previous studies and were anchored on the five point Likert scale with "1 strongly disagree and 5" strongly agree. Appendix one shows the measures of the constructs of the study. Data was analysed using the Partial Least Square Structural Equation Modelling (PLS SEM). According to Hair et al. (2019). PLS SEM is used to evaluate the measurement of latent variables and test relationships between latent variables PLS-SEM normsally achieves higher levels of statistical power and demonstrates much better convergence behaviour than CB-SEM.

4. RESULTS

4.1. Response rate and Biographical Details of the Respondents
930 questionnaires were distributed during data collection and 444 returned and found usable. Table 1 depicts the biographical details of the respondents.

Table 2 depicts the measurement model. The results show that the factor loadings are above 0.708, Cronbach's alpha >0.700, average variance explained >0.500. Thus convergent validity is established. Table 3 depicts the results of the Fornell Lacker criterion. In addition, the values of the HTMT are lower than 0.850 as depicted by Table 4 thus confirming adequate discriminant validity.

4.2. Structural Model
The evaluation of the structural model considered the common method bias (CMB), the R^2, the Q^2, and the evaluation of the path coefficients. The CMD values were lower than the 3.3 threshold and the integrated model's (R^2) explained 68.5% of the variance of intention to save energy. The GOF of 0.337, and Q^2 of 0.415 suggest the significant predictive power of the model. The effect size values range from 0.277 to 0.291and the standardised root
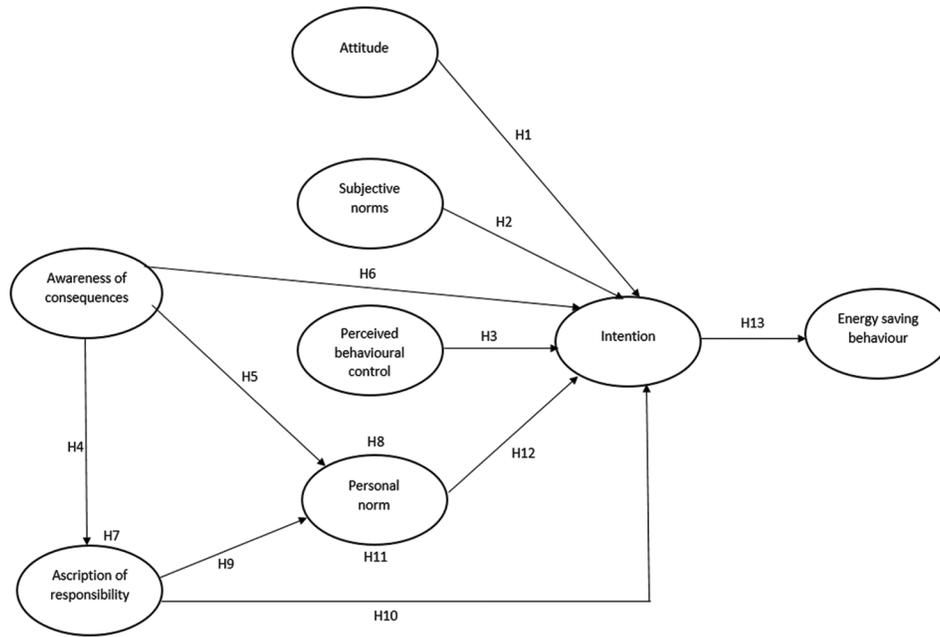
Figure 1: Conceptual model

Table 1: Biographical details of the respondents

Biographical details	No of respondents
Gender	
Male	229
Female	215
Age	
21-30	135
31-40	185
41-50	98
51-60	26
Educational qualification	
Matric	256
Above matric	188

mean square residual (SRMR) obtained in the study is 0.01.

Table 5 depicts the results of the testing of the hypotheses. The results ($\beta = 0.264$, T = 7.409, P < 0.01) show that attitude and intention are significantly positively related supporting hypothesis one. The results ($\beta = 0.058$, T = 0.103, P > 0.05) depict an insignificant relationship between subjective normss and intention. Hypothesis two not supported. The results ($\beta = 0.204$, T = 3.008, P < 0.05) indicate that perceived behavioural control and intention are significantly positively related, supporting hypothesis three. The results ($\beta = 0.198$, T = 5.071, P < 0.05) show that awareness of consequences and ascription of responsibility are significantly positively related supporting hypothesis four. The results ($\beta = 0.311$, T = 3.402, P < 0.01) depict an significant positive relationship between awareness of consequences and personal norms. Hypothesis five is supported. The results ($\beta = 0.207$, T = 4.481, P < 0.01) indicate that awareness of consequences and intention are significantly positively associated, supporting hypothesis six. The results ($\beta = 0.192$, T = 3.737, P < 0.05) show that ascription of responsibility and personal norms are significantly positively related supporting hypothesis nine The results ($\beta = 0.208$, T = 4.102, P > 0.01) depict a significant

positive relationship between ascription of responsibility and intention. Hypothesis ten is supported. The results ($\beta = 0.277$, T = 5.609, P < 0.05) indicate that personal norms and intention are significantly positively associated, supporting hypothesis eleven. The results ($\beta = 0.195$, T = 3.664, P < 0.05) show that intention and behaviour are significantly positively related supporting hypothesis twelve.

The mediation results are depicted by Table 6. The results indicate that the direct effects and indirect effects are significant. Also, the variance accounted (VAF) value bigger than 80% represents full mediation, a VAF value of between 20% and 80% means a partial mediation, while a value below 20% means no mediation. In addition, for complementary mediation, the indirect effect and the direct effect are significant and point in the same direction. For competitive mediation, the indirect effect and the direct effect are significant but point in opposite directions while for indirect-only mediation, the indirect effect is significant, but not the direct effect (Hair et al., 2019). The VAF values are below 80% and a complimentary partial mediation is confirmed. The results indicate that the relationship between awareness of consequences and personal norms is partially mediated by ascription of responsibility supporting hypothesis 7. Also, the results show that the relationship between awareness of consequences and intention is fully mediated by personal norms supporting hypothesis 8. In addition, the results indicate that the relationship between ascription of responsibility and intention is partially mediated by personal norms supporting hypothesis 11.

5. DISCUSSION

The hospitality industry positively contributes to job creation, poverty reduction and socio-economic development. However, the industry is generally energy intensive facilities with associated high energy and environmental costs. Therefore, it is important to understand the factors that can help to reduce energy (electricity)

Table 2: Measurement model

Construct	Measurement item	Factor loading	Cronbach's alpha	Composite reliability	AVE
Awareness of consequences (AWA)	AWA1	0.804	0.811	0.849	0.585
	AWA2	0.782			
	AWA3	0.743			
	AWA4	0.729			
Ascription of responsibility (ASC)	ASC1	0.772	0.775	0.867	0.620
	ASC2	0.801			
	ASC3	0.826			
	ASC4	0.749			
Personal norms (PER)	PER1	0.764	0.782	0.861	0.608
	PER2	0.807			
	PER3	0.799			
	PER4	0.748			
Attitude (ATT)	ATT1	0.813	0.860	0.852	0.591
	ATT2	0.782			
	ATT3	0.749			
	ATT4	0.727			
Subjective norms (SUB)	SUB1	0.764	0.770	0.803	0.576
	SUB2	0.782			
	SUB3	0.731			
Perceived behavioural control (PER)	PER1	0.829	0.808	0.833	0.626
	PER2	0.801			
	PER3	0.738			
Intention (INT)	INT1	0.844	0.841	0.839	0.635
	INT2	0.804			
	INT3	0.739			
Behaviour (BEH)	BEH1	0.819	0.762	0.901	0.564
	BEH2	0.729			
	BEH3	0.808			
	BEH4	0.731			
	BEH5	0.747			
	BEH6	0.726			
	BEH7	0.759			

Table 3: Fornell-Lacker

CON	AWA	ASC	PER	ATT	SUB	PER	INT	BEH
AWA	**0.765**							
ASC	0.541	**0.787**						
PER	0.601	0.526	**0.780**					
ATT	0.499	0.416	0.508	**0.769**				
SUB	0.373	0.388	0.407	0.386	**0.760**			
PEC	0.562	0.601	0.582	0.495	0.608	**0.791**		
INT	0.693	0.601	0.555	0.487	0.599	0.542	**0.797**	
BEH	0.505	0.402	0.557	0.538	0.604	0.615	0.588	**0.751**

Diagonals in bold signify the square root of the AVE while the other figures depict the correlations.

Table 4: HTMT

CON	AWA	ASC	PER	ATT	SUB	PER	INT	BEH
AWA								
ASC	0.588							
PER	0.604	0.617						
ATT	0.531	0.588	0.602					
SUB	0.601	0.597	0.608	0.611				
PEC	0.618	0.603	0.557	0.618	0.577			
INT	0.600	0.651	0.628	0.639	0.572	0.608		
BEH	0.604	0.552	0.607	0.672	0.699	0.593	0.606	

Table 5: Path coefficient and T-statistics

Hypothesised path	Path coefficient	T-statistics	Decision
H1 ATT→INT	0.264	7.409*	Supported
H2 SUB→INT	0.058	0.103	Rejected
H3 PER→INT	0.204	5.071**	Supported
H4 AWA→ASC	0.198	2.808**	Supported
H5 AWA→PER	0.311	3.402*	Supported
H6 AWA→INT	0.207	4.481*	Supported
H9 ASC→PER	0.192	3.737**	Supported
H10 ASC→INT	0.208	4.102*	Supported
H11 PER→INT	0.277	5.609**	Supported
H12 INT→BEH	0.195	3.664**	Supported

*P<0.01; **<0.05

The findings indicated that two of three constructs of the TPB, attitude and perceived behavioural control are significantly positively related to energy saving intention. The effect of subjective normss is insignificant. The findings suggest that when an employee has a positive attitude towards energy saving, he/she will develop the intention to save energy. In addition, employees are likely to develop intention to save energy if they have the necessary skills and resources to do so. The findings are consistent with prior empirical studies that have used the TPB to investigate energy saving behaviour. Macovei (2015) finds that attitude has a significant positive relationship with intention to conserve energy. The findings of the study by Liu et al. (2020) show that attitude and perceived behavioural control are significant factors in household energy conservation intention. Canova and

consumption by hotels. The study examined the antecedents of employee energy saving behaviour in hotels by integrating the TPB and the NAM. This approach enables the researcher to take into consideration employee self-interested and rational motives and belief based on normss and morality.

Table 6: Mediation results

Mediation path	Indirect effect	Total effect and T-statistics	Confidence interval bias (corrected)		Decision	VAF
			LL	UL		
H7AWA→ASC→PER	0.194*	0.308* (1.499)	0.064	0.228	Accepted (partial mediation)	62.99%
H8AWA→PER→INT	0.139*	0.171* (1.116)	0.046	0.182	Accepted (full mediation)	81.29%
H11ASC→PER→INT	0.171**	0.302**	0.052	0.177	Accepted (partial mediation)	56.62%

*P<0.01; **<0.05

Manganelli (2020) find that attitude and perceived behavioural control are positively related to intention to save energy at work. The findings of the study by Chen and Chen (2021) show that that attitude and perceived behavioural control are positively correlated to employee energy conservation habit.

The three constructs of NAM are positively related to intention to save energy. In addition, the findings indicate that awareness of consequences is positively related to ascription of responsibility, personal normss and intention. In addition, the findings show that the relationship between awareness of consequences and personal norms is mediated by ascription of responsibility. Also, the relationship between awareness of consequences and intention is mediated by personal norms. The findings suggest that when employees are aware of the negative consequences of energy consumption, this will affect their moral obligation and intention to save energy. The findings are consistent with the results of prior empirical studies. Zhang et al. (2013) find that awareness of consequences is positively related to ascription of responsibility and personal norms in the context of electricity saving. The findings of the study by Onwezen et al. (2013) show that awareness of consequences positively influences ascription of responsibility and this in turn affects personal norms. Dalvi-Esfahani et al. (2016) find that the relationship between awareness of consequences of adverse environmental condition and intention to adopt green information system is partially mediated by personal norms. Wang et al. (2018) find that both awareness of consequences and ascription of responsibility activate personal norms which in turn positively affect the recycling intention of residents.

The findings indicated that ascription of responsibility is significantly positively related to personal norms and intention. In addition, the relationship between ascription of responsibility and intention is mediated by personal norms. The findings suggest that the feelings of responsibility by an individual of the adverse effects of not saving energy can positively affect energy saving behaviour. The findings are consistent with the results of prior empirical studies. Zhang et al. (2013) find a significant personal relation between ascription of responsibility and personal norms. Mamun et al. (2022) find that ascription of responsibility positively affects personal norms. Xu et al. (2020) find that ascription of responsibility positively affects employee energy saving behaviour at work.

The findings indicate that personal norms has a positive and significant impact on intention to save energy. Personal norms describes the feelings of moral obligations to do the appropriate thing. The findings are consistent with prior empirical studies. Zhang et al. (2013) find that personal norms are positively related to energy saving behaviour. Wang et al. (2018) find that personal norms positively affects urban residents' energy saving behaviour. Mamun et al. (2022) finds that personal norms affects the energy conservation intention of Malaysian Youth. The findings of the study by Wang et al. (2019) show a significant positive relationship between personal norms and employee workplace energy saving behaviour.

The findings indicated that intention to save energy is positively related to employee energy saving behaviour. Ajzen (1991) points out that intention is the antecedent of behaviour. Macovei (2015) find that intention positively affects energy conservation behaviour. Mamum et al. (2022) find that intention to conserve energy positively affects energy conservation behaviour.

6. CONCLUSION

The study examined the antecedents of employee workplace energy saving behaviour by integrating the TPB and NAM. The findings showed that two TPB constructs, attitude and perceived behavioural control are significantly positively related to energy saving behaviour. The findings also indicated that three NAM constructs, awareness of consequences, ascription of responsibility and personal norms are positively related to intention to save energy. In addition, energy saving intention has a significant positive effect on energy saving behaviour.

Theoretically, the findings of the study confirm the applicability of the integrated TPB and NAM in explaining energy saving behaviour by employees in the workplace. Two constructs of the TPB and three constructs of NAM are positively linked to employee energy saving intention. The findings of the study provide empirical support for combining TPB and NAM variables in the context of employee energy saving behaviour.

The findings of the study have practical implications for hospitality firms. Hotel owners must take into consideration employees in their efforts to reduce energy consumption. Training and organisational policy on energy conservation can help to develop a favourable attitude. To improve personal norms, awareness of consequences and ascription of responsibility, there is the need for enhanced publicity campaign by government about the negative effects of energy consumption on the environment.

The study has the following limitations: Data was collected from employees of hospitality firms in only three South African cities. The generalisability of the findings can be improved by expanding data collection to hotels in other cities of South Africa. Self-report bias might have occurred during data collection from employees.

Therefore, it may be necessary to also collect data from the owners/managers of hotels about energy conservation behaviour of employees. Demographic factors such as age and gender can moderate the relationship between intention and energy saving behaviour. These variables were not included in the study and can be examined by future research. The use of the cross-sectional research design limits causality and a longitudinal research approach by other studies can help to overcome this limitation.

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APPENDIX ONE MEASURES

Construct	Items	Adapted from
Awareness of consequences	1. Electricity consumption at work exhausts available electricity. 2. Electricity consumption at work damages the local ecological environment. 3. Electricity consumption at work leads to global warming and contributes to climate change 4. Electricity consumption at work can lead to negative consequences	De Groot and Steg (2009); Onwezen et al. (2013) Zhang et al. (2013)
Ascription of responsibility	1. I feel partly responsible for the exhaustion of electricity. 2. I feel partly responsible for the impact of consumption on global warming 3. I feel partly responsible for the effect of electricity consumption on local environment. 4. I feel partly responsible for the negative consequences of electricity consumption.	De Groot and Steg (2009); Onwezen et al. (2013); Zhang et al. (2013)
Personal norms	1. Not saving electricity at work will be against my moral principles. 2. I would feel guilty if I do not save electricity at work 3. It is my moral obligation to save electricity at work. 4. I feel obliged to save electricity at work.	De Groot and Steg (2009); Onwezen et al. (2013); Zhang et al. (2013)
Attitude	1. I think that saving electricity in my workplace is useful to protect the environment. 2. I think that saving electricity in my workplace is significant to reduce carbon emissions. 3. I think that saving electricity in my workplace is valuable to reduce electricity shortage. 4. I think that saving electricity in my workplace is a wise decision.	Ajzen (1991) and Gao et al. (2017)
Subjective norms	1. My colleagues that that I should save electricity in the workplace. 2. My managers think that I should save electricity in the workplace. 3. Other people that are important to me think that I should save electricity in the workplace.	Ajzen (1991) and Gao et al. (2017)
Perceived behavioural control	1. I think that I am capable of saving electricity in my workplace. 2. I have the knowledge and skill to save electricity in the workplace. 3. Whether or not I save electricity is completely up to me.	Ajzen (1991) and Gao et al. (2017)
Intention	1. I am willing to save electricity at work. 2. I intend to save electricity at work 3. I plan to save electricity at work.	Zhang et al. (2014)
Behaviour	1. I turn off the lights when going out at work 2. I open the windows to reduce the use of the fan/air conditioner at work 3. When not in use, I switch off the computer at work 4. I limit the duration that the refrigerator door is kept open at work 5. I turn off the lights when the sunshine is bright enough at work. 6. When the air conditioner is on, I properly close the room door at work 7. When leaving work, I switch off all lights.	Zhang et al. (2014)