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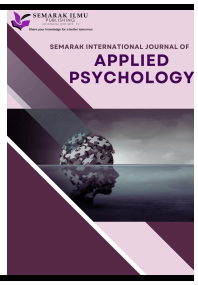

Psychological Determinants in Influencing Residents Adoption Intention of Home Energy Efficiency Measures: A Case in East Malaysia

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ABSTRACT

In recent years, energy demand has been growing fast, primarily driven by global population growth. The residential sector is a major contributor to rising energy needs, accounting for 20.5% of Malaysia's energy consumption. A substantial portion of domestic energy is used for electrical appliances, water heating, cooling and lighting, all of which contribute to increased greenhouse gas emissions. To reduce energy demand, carbon emissions and energy costs at both household and national levels, energy efficiency measures can play a crucial role. However, the factors influencing the adoption of these measures remain unclear within the Malaysian context. This study aims to explore the significance of psychological determinants in influencing residents' intentions to adopt home energy efficiency measures. Grounded in the Theory of Planned Behavior, a theoretical framework was developed, incorporating an additional variable to assess its potential impact on residents' intentions to adopt home energy efficiency measures. A systematic literature review identified four key psychological determinants—attitude, subjective norm, perceived behavioral control and past experience—as influencers of residents' intentions to adopt energy efficiency measures. A questionnaire survey was conducted among 286 residents in Sibu, Sarawak. Frequency analysis was used to examine demographic information, and Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed to analyze relationships within the model. Findings revealed that all determinants, except subjective norm, significantly influence households' intentions to adopt home energy efficiency measures. The results provide insights for marketers and policymakers to shape targeted strategies, fostering a more sustainable society.

1. Introduction

Global energy demand is rapidly increasing, with the world's population expected to reach 9 billion by 2050. This growth is primarily due to improved living standards, economic improvement and rapid urban development, leading to an increase in global energy demand from housing occupants [1]. Buildings consume up to 40% of overall world energy, and it is expected to rise to at

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least 50% in 2030. The residential sector is a major contributor to rising energy needs, with household appliances accounting for 3636 TWH globally, an increase of 73 TWH from 2019 [2]. The Green Technology Master Plan Malaysia 2017-2030 predicts a rapid increase in housing energy usage in Malaysia due to increased appliance ownership, improved household income and living standards. The residential sector accounts for 20.5% of Malaysia's energy consumption [3], primarily used for electrical appliances, water heating, cooling and lighting. This contributes to rising greenhouse gas emissions. However, energy efficiency measures can potentially save significant energy by reducing energy demand, carbon emissions and energy expenditures [4]. Modern energy-efficient appliances, such as air-conditioners, LED light bulbs, refrigerators, TVs and fans can significantly improve efficiency.

Studies on energy conservation and efficiency have been conducted in many countries in recent years. For instance, Xu *et al.,* [5] conducted research in Singapore to examine the development of an efficient and affordable intervention to promote energy-saving building options in the Singapore residential sector. Besides, research carried out by Nie *et al.,* [6] in China to assess the existing policy of subsidizing energy-efficient home appliances and provided guidance the government on how to enhance the policy's effectiveness. However, changes towards environmentally sustainable behaviour is much more difficult to implement [7]. Attributes influence a specific desired behaviour such as the intention to adopt energy efficiency measures in households. There has been little discussion focused on the factors that influence adoption intentions for energy-efficient appliances [8-9].

Malaysia is dedicated to climate action and aim to becoming a carbon neutral nation by 2050. According to the research carried out by Ilham *et al.,* [10] Malaysia still highly relies on the non-renewable energy such as fossil fuel although solar energy considered has highest potential renewable energy in replacing fossil fuel. According to Mohd. Rohaisham and Muhamad Salleh [11], solar energy has been proved as an alternative in reducing the electricity bills in university. Besides, Malaysia government has established a number of policies and initiatives to encourage the use of energy efficient appliances, target to lowering household electricity consumption. However, majority of the Malaysian resist to change their household appliances to energy efficiency measure due various factors such as higher price, limited understanding of renewable energy initiatives, etc [12]. An individual's behaviour is influenced by a set of psychological determinants. Exploring the determinants that influence households' intentions to adopt energy-efficient measures will enable more targeted and focused strategies to encourage nationwide adoption of energy-efficient products and practices. Hence, this study aims to identify the psychological determinants that influence residents' intention to adopt home energy efficiency measures.

2. Literature Review

2.1 Home Energy Efficiency Measures

Adoption of energy-saving measures in the residential is voluntary. Application of energy efficiency measures has the possibility to save electricity in the household sector. However, residents are voluntary adoption of energy efficiency measures to reduce energy consumption. Thus, it is necessary to assess first the intentions to embrace energy conservation measures. Energy efficiency is using less electricity to generate the similar quantity of an output or function [13]. According to the World Energy Council [14], energy efficiency encompasses those adjustments that result in a lower in the amount of energy needed for a given service. Energy efficiency is linked to economic efficiency since it combines behavioural, economic and technological improvements. Besides, energy efficiency provides a variety of benefits including reduce waste by using less energy to complete the same tasks,

lower the demand of energy and carbon emissions and reduce energy expenditures of household as well as national [4]. For instance, LED light bulbs consume 75 to 80% less electricity than incandescent lamps to provide the same amount of light.

2.2 Theoretical Framework

This research adopts Theory of Planned Behaviour (TPB) by Ajzen [15] to predict the resident intention to adopt home energy efficiency measures. According to Robinson and Smith [16], TPB has the capability of examining and evaluating human behaviour and characteristics. Besides, TPB widely used in pro-environmental behaviour context to examine consumer's behaviour [9,17-24]. For instance, TPB has been adopted in recycling behaviour [17-18], energy-efficient home appliances purchase behaviour [9,19-20], energy saving behaviour such as electricity [21-23], acceptance of smart home energy technology [24] and others. Therefore, this study adopted Theory of Planned Behaviour as a fundamental basis and including an additional variable which is past experiences.

In short, this study has ascertained four psychological determinants which are attitude, subjective norm, perceived behavioural control and past experience and each of the determinants will be further discussed in following sub-sections. Figure 1 shows the theoretical framework of this study which consist of four variables including attitude, subjective norm, perceived behavioural control and past experience.

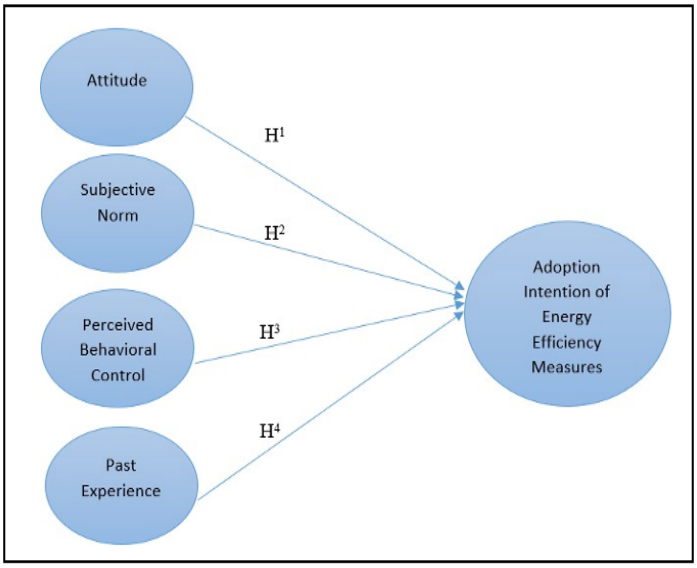

Fig. 1. Theoretical framework of this study

2.2.1 Attitude

An individual's behaviour is an emotional state of preparedness that is taught and organized through expertise, and it has a significant impact on how they respond to the people, items and situations with that they are associated [25]. Similarly, Ajzen [26] mentioned that someone who has a good attitude about an action is much more to perform it out. Several studies have shown that consumer's intention significantly impacted by their attitude. For instance, according to the research carried out by Wang *et al.,* [22] in China, claims that attitudes have a positive influence on people's intentions to conserve electricity. Moreover, Abu-Elsamen *et al.,* [9] also claims that consumer's purchase intention toward energy-saving products has strongly impacted by their attitude. Similarly, Lin and Dong [19] also points out that consumer's attitude is the major predictors in impacting

consumer's intention to purchase the energy-efficient home appliances compared to subjective norm and perceived behavioural control. Hence, the following hypothesis is formed:

Hypothesis (H^1): The attitude of residents has influence on their intention to adopt home energy efficiency measures.

2.2.2 Subjective norm

According Ajzen [15], subjective norm refers to the social factor that indicate the perceived necessity of consumer's behaviour. Subjective norm can describe as social stress from a person's reference group that can impact that person to engage in those behaviours. Recent studies have shown that subjective norm has significant relationship on consumer's intention. For instance, the research carried out by Ji and Chan [24] argues that subjective norm is a significant determinant that can influence the acceptance of Smart Home Energy Technology in China. In the same vein, Lin and Dong [19] also argues that subjective norm has significant impact on purchase intention toward energy-efficient home appliances significantly. Other than that, the study conducted by Webb *et al.,* [21] also demonstrates that subjective norm has been discovered as an important determinant in resident intention to participate in energy-saving behaviour. Thus, it was hypothesised that:

Hypothesis (H^2): The subjective norm of resident has influence on their intention to adopt home energy efficiency measures.

2.2.3 Perceived Behavioural Control (PBC)

PBC is defined as the level to that a people who think prepared to engage in a specific behaviour [15]. PBC has been proved as an useful tool in studying users' intentions. According to Ajzen [15], PBC is a two-pronged concept which encompassing an individual's level of control over a person's behaviour and the level of certainty that a person feels toward accepting or refraining from performing that particular behaviour. A number of studies have reported that PBC has significant impact on consumer's intention. For instance, Harun *et al.,* [20] found a significant correlation between PBC and the intention to adopt energy efficient appliances among Malaysian residents. Besides, Lin and Dong [19] also claims that consumer's purchase intention toward energy-efficient home appliances in Taiwan impacted by perceived behavioural control. It also can be illustrated in research by Salim *et al.,* [23] found a significant correlation between PBC and the intention of residents to decrease their electricity use in Pakistan. Therefore, it was hypothesised that:

Hypothesis (H^3): The PBC of resident has influence on their intention to adopt home energy efficiency measures.

2.2.4 Past experience

The past experience is a person's previous experience and it will give impact to their willingness to accomplish a specific behaviour [15]. The intention of adopting energy efficiency measures will be influenced by past experience because they will learn from their previous experiences. Hence, based on the past studies, past experience is a good predictor of a person's willingness to adopt in energy-saving behaviour. Someone who has already involved in some energy-saving measures, or home owners who already have experienced power outages in the past would be more concerned about

energy conservation [27]. Recent studies focused on waste separation behaviour [28] and recycling behaviour [17] also claims that the past experience will impact consumer intention. Thus, the hypothesis is:

Hypothesis (H^4): The past experience of resident has influence on their intention to adopt home energy efficiency measures.

2.2.5 Home energy efficiency measures adoption intention

Adoption intention can be described as the individual's intention to perform a specific behaviour, which in current context is their intention to purchase and adopt home energy efficient measures. Individual's energy-saving intention refer to the individual's self-commitment to participate in energy saving behaviours [29]. A strong intention towards the adoption of energy efficiency measures, the more likely it is for the individual to actual adoption [30]. Ru *et al.,* [31] also has indicated that adoption intention was related positively to individuals' energy saving behaviour.

3. Research Methodology

The current study identified the psychological determinants that influence intention of residents in East Malaysia to adopt home energy efficiency measures. Sibu was selected as case study area since it is situated under the project of Sawarak Corridor of Renewable Energy (SCORE) with a population size of 284.6 thousand [32-33]. Therefore, the targeted respondents were the residents in Sibu, Sarawak. Convenience sampling method was applied since it considered as a simple and easy sampling technique. A quantitative method was applied and the questionnaire developed was distributed to the respondents through online platform including WhatsApp, Facebook and Instagram due to the safety concerns, low cost and validity consideration. The questionnaire consists of two sections. Section 1 focused on the demographic of the respondents and Section 2 measured the willingness of the residents to adopt household's energy efficiency measures in Sibu, Sarawak. A five-point Likert scale was adopted in the questionnaire. For the variables adopted from Theory of Planned Behaviour (TPB), the respondents were asked to rate based on the five point Likert scale which comprise 1 = Strongly Disagree to 5 = Strongly Agree while for the additional variable which is past experience, the respondents were asked to rate based on the five point Likert scale which comprise 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always.

A total of 286 completed questionnaires were screened and qualified for analysis. Frequency analysis and partial least square structural equation modelling (PLS-SEM) were applied for the data analysis. Frequency analysis were used to analyse the data related to the demographic of the respondents while partial least square structural equation modelling (PLS-SEM) were used to analyse the casual relationship between the model constructs. Partial least square structural equation modelling (PLS-SEM) is particularly useful in studying the casual relationship between the model constructs [1,34-35]

4. Results and Findings

4.1 Respondent Profile

Table 1 presents the respondents' demographic profiles. Most respondents were male (50.3%), while only 49.7% were female. Besides, most of the respondents were between 26 to 30 years old (26.2%), followed by those between 31 to 35 years old (23.4%), while respondents aged 50 and above

were the least. Most of the respondents is Chinese (58.4%) while only 7 respondents were Indians. Moreover, respondents with a bachelor's degree accounted for the highest proportion, 43.7% while the second highest were respondents with Diploma (37.1%). Furthermore, most respondents involved in 4 person of household while only 10.8% of the respondents involved in 2 person of household. The majority of respondents were dwelling in Double Storey (49.3%), followed by Semi Detached (22.4%), while only 15 respondents were dwelling in Bungalow. In addition, the monthly household income for most of respondents were between RM5,880 to RM7,099 (25.9%) while only 2 respondents had their monthly household income more than RM15,039. For the monthly electricity bills, most respondents spent between RM101 to RM150 (45.8%) and only least respondents spent between RM351 to RM400 (0.3%) and more than RM400 (0.3%). According to the collected data, energy efficiency LED light bulb were more adopted by the residents in Sibu, Sarawak, followed by energy efficiency air conditioner while others energy efficiency appliance such as solar panel and water heater were least adopted by the residents in Sibu, Sarawak.

Table 1
Demographic profile of the respondents

Variables	Description	Frequency	Percentage (%)
Gender	Male	144	50.3%
	Female	142	49.7%
Age	Below 25 years old	56	19.6%
	26 – 30 years old	75	26.2%
	31 – 35 years old	67	23.4%
	36 – 40 years old	43	15.0%
	41 – 50 years old	39	13.6%
	Above 50 years old	6	2.1%
Race	Malay	99	34.6%
	Chinese	167	58.4%
	Indian	7	2.4%
	Others	13	4.5%
Highest Educational Qualification	Postgraduate (Master and PhD)	8	2.8%
	Bachelor's degree	125	43.7%
	Diploma	106	37.1%
	High School (A-Level, STPM and other post SPM certificates)	33	11.5%
	Secondary	12	4.2%
	Primary and no formal education	1	0.3%
Household size	2 persons	31	10.8%
	3 persons	70	24.5%
	4 persons	100	35%
	5 persons and above	85	29.7%
Dwelling type	Single storey	49	17.1%
	Double storey	141	49.3%
	Semi Detached	64	22.4%
	Bungalow	15	5.2%
	Flat and apartment	17	5.9%
Monthly Household Income	RM15039 and above	2	0.7%
	RM10960 to RM15039	3	1.0%
	RM8700 to RM10959	7	2.4%
	RM7100 to RM8699	42	14.7%
	RM5880 to RM7099	74	25.9%
	RM4850 to RM5879	7	2.4%
	RM3970 to RM4849	65	22.7%
	RM2500 to RM3969	47	16.4%
	Below RM2,500	39	13.6%
	RM400 and above	1	0.3%

Monthly Electricity Bills	RM351 to RM400	1	0.3%
	RM301 to RM350	2	0.7%
	RM251 to RM300	2	0.7%
	RM201 to RM250	20	7.0%
	RM151 to RM200	72	25.2%
	RM101 to RM150	131	45.8%
	RM 51 to RM100	52	18.2%
	Below RM50	5	1.7%
Energy Efficiency Appliance Have Adopted Currently	Air conditioner		217
	Washing machine		128
	Television		109
	Fan		101
	Kitchen appliances		196
	LED light bulbs		229
	Others (solar panel & water heater)		3

4.2 SEM-PLS Analysis

According to Hair *et al.,* [36] SEM-PLS serves as the most popular analytical method for evaluating the model of relationship between cause and effect with potential variables. SEM-PLS has been widely used in various research fields since this analytical method able to deal with nonnormal data, limited sampling size and formative indicators [36]. Therefore, SEM-PLS was adopted to explore the significance of the psychological determinants in influencing resident's adoption intention of energy efficiency measures.

In this study, the four psychological determinants that influence a household's intention to adopt home energy efficiency measures including attitude, subjective norm, perceived behavioural control and past experience. A total of 24 items were used to assess the psychological determinants. Table 2 shows the items for each variable. The SEM-PLS data analysis consists of two stages, the measurement model assessment and structural model assessment.

Table 2
Items for each variable

Variable	Item	
Attitude (ATT)	I believe that adopting energy efficiency measures contribute to a reducing in greenhouse gas emissions.	A1
	I believe that adopting energy efficiency measures can contribute to protect the environment.	A2
	I think the adoption of energy efficiency measures is desirable.	A3
	Energy efficiency home appliances consumes less energy than the conventional type.	A4
	I can reduce my electricity bill by adopting energy efficiency measures at home.	A5
Subjective Norm (SN)	Advice from my family influenced my decision to adopt energy efficiency measures.	SN1
	My neighbour think I should adopt energy-efficient ones when it comes to choice of household appliances.	SN2
	My friends think that I should adopt energy efficient measures at home.	SN3
	If I adopt energy efficiency measures, I think this can influence other people to adopt energy efficiency measures.	SN4
	My friends are likely to praise me when I adopting energy efficiency measures at home.	SN5
Perceived Behavioral Control (PBC)	For me to adopt energy efficiency measures at home is very possible.	PBC1
	The decision to adopt energy efficiency measures is totally up to me.	PBC2
	I have resources and ability to adopt energy efficiency measures.	PBC3
	I will buy energy efficiency home appliances even my friends advise me not to.	PBC4
	Household energy efficiency measures are easy to perform.	PBC5

Past Experience (PE)	I adopted energy saving measures and it resulted in electricity bill reduction.	PE1
	I purchased home appliances with energy efficiency labelling.	PE2
	The experience is good when I use the energy-efficient appliances in my home.	PE3
	I replaced traditional incandescent light bulb with LED light bulb for greater energy efficiency.	PE4
	I replaced refrigerators with ENERGY STAR-certified refrigerators in the home.	PE5
Adoption Intention (INT)	I intend to adopt energy efficiency measures at home.	INT1
	I intend to shift from the use of traditional appliances to energy efficient appliances.	INT2
	I am willing to persuade my other family members to adopt energy efficiency measures at home.	INT3
	I am willing to buy electrical appliances with higher star rating for a better energy efficiency.	INT4

4.2.1 Assessment of measurement model

The measurement model is evaluated by assessing the items reliability and validity include convergent validity and discriminant validity. The measurement model's convergent validity is determined by evaluating the outer loadings and Average Variance Extracted (AVE) while discriminant validity is determined by evaluating the Fornell & Lacker Criterion and Heterotrait-Monotrait (HTMT) ratio.

(a) Convergent validity

Table 3 illustrate that the result of construct reliability and validity. For the internal consistency reliability, it is determined by evaluating the Cronbach's Alpha and composite reliability. The Cronbach's alpha also is another measure of internal consistency with value of 0.70 and above are acceptable [37]. In Table 3, the Cronbach's alpha for attitude, subjective norm, past experience and adoption intention ranged between 0.717 to 0.830, indicating a satisfactory internal consistency of measures except for the perceived behavioural control. Moreover, the value of composite reliability for all of the construct are considered acceptable since all items consist value above 0.70 which can be considered as satisfactory[38].

Besides, outer loadings of the items and the average variance extracted (AVE) will be considered in order to evaluate the convergent validity [38]. In order to achieve convergent validity, the outer loadings must be above 0.70 [38]. Therefore, the items with outer loading above 0.70 remained while the items with outer loadings below 0.70 including A3, A5, SN1, SN2, PBC4, PBC5, PE3 and INT will be deleted. Other than that, as suggested by Hair *et al.,* [38] the value of Average Variance Extracted (AVE) should above 0.50 which indicate that the construct could explain half of the indicator variance. Table 3 shows that the value of Average Variance Extracted (AVE) for all items range from 0.611 to 0.702 which are above 0.50, hence, it indicating the constructs in the model could explain at least 61% of the indicator variance.

Table 3
The result of construct reliability and validity

Constructs	Measurement items	Item loading	Cronbach's Alpha	Composite Reliability (CR)	AVE
Attitude (ATT)	A1	0.876			
	A2	0.879			
	A3 deleted	0.668	0.784	0.875	0.702
	A4	0.752			
	A5 deleted	0.672			
Subjective norm (SN)	SN1 deleted	0.531			
	SN2 deleted	0.658			
	SN3	0.765	0.712	0.841	0.634
	SN4	0.809			
	SN5	0.814			
Perceived Behavioral Control (PBC)	PBC1	0.779			
	PBC2	0.796			
	PBC3	0.770	0.682	0.825	0.611
	PBC4 deleted	0.684			
	PBC5 deleted	0.714			
Past Experience (PE)	PE1	0.865			
	PE2	0.883			
	PE3 deleted	0.677	0.830	0.886	0.661
	PE4	0.728			
	PE5	0.767			
Adoption Intention (INT)	INT1 deleted	0.681			
	INT2	0.802	0.717	0.839	0.638
	INT3	0.830			
	INT4	0.764			

(b) Discriminant validity

Discriminant validity is assessed by Fornell & Lacker Criterion and Heterotrait-Monotrait (HTMT) ratio. The criterion of Fornell-Larcker [39] has been widely applied to evaluate the degree of shared variance between the latent variables of the model. Table 4 outlined the Fornel-Lacker Criterion analysis. The square roots of AVEs are depicted on the diagonals and are all greater than the corresponding correlation coefficients within the constructs. It can be concluded that the measurement model is satisfactory. Table 5 shows the results of Heterotrait-Monotrait (HTMT) ratio of correlations and outlined that all the value ranging from 0.611 to 0.892. Therefore, it can be concluded that, the result of the Heterotrait-Monotrait (HTMT) for this research is statistically fulfilled the HTMT ratio discriminant validity criteria suggested by Henseler *et al.,* [40] since all of the values are below than 0.90. Similarly, Hair *et al.,* [38] also point out that the value of Heterotrait-Monotrait (HTMT) should be less than 0.90 in order to provide a discriminant validity.

Table 4
Fornel-Lacker Criterion Analysis

Fornell-Larcker Criterion Analysis for Checking Discriminant Validity					
	ATT	**INT**	**PBC**	**PE**	**SN**
ATT	**0.838**				
INT	0.620	**0.799**			
PBC	0.524	0.627	**0.782**		
PE	0.580	0.577	0.469	**0.813**	
SN	0.503	0.532	0.548	0.484	**0.796**

Table 5
Heterotrait-Monotrait Ratio of Correlations

Heterotrait-Monotrait Ratio (HTMT)					
	ATT	**INT**	**PBC**	**PE**	**SN**
ATT					
INT	0.826				
PBC	0.722	0.892			
PE	0.705	0.731	0.611		
SN	0.677	0.740	0.781	0.612	

4.2.2 Assessment of structural model

After the assessment of measurement model, this step is to evaluate the structural model [38]. In this step, all the hypotheses will be tested [38]. The value of coefficient of determination (R^2) widely used to evaluate the structural model [38]. The range of the value of R^2 is between 0 to 1 [38]. As suggested by Hair *et al.,* [38], the higher the value of R^2 , the higher the probability of accurate the prediction. In this research, the value of R^2 was 0.547, which means the model explains 55% of the variance in adoption intention of energy efficiency measures. Besides that, the ranged of effect size (f^2) is from 0.019 to 0.139, indicating that the effect sizes are ranged from small to medium as recommended by Cohen [41]. Moreover, to assess the significance of the path coefficients and the loadings, a method of bootstrap resampling of 5,000 subsamples was used. Table 6 shows the assessment results of the structural model. The hypothesis testing results indicate that three out of the four hypotheses were supported, while one was rejected. Specifically, hypotheses H^1 ($\beta = 0.269$, $T = 3.299$, $p < 0.05$), H^3 ($\beta = 0.321$, $T = 4.255$, $p < 0.05$), and H^4 ($\beta = 0.214$, $T = 3.304$, $p < 0.05$) were supported, suggesting that attitude, perceived behavioural control, and past experience have a positive and significant influence on residents' intentions to adopt home energy-efficient measures. However, subjective norm was found to be insignificant in influencing residents' adoption intentions ($\beta = 0.117$, $T = 1.770$, $p > 0.05$). Figure 2 shows the psychological determinants in influencing residents adoption intention of home energy efficiency measures.

Table 6
The assessment results of the structural model

Relationship	Coefficient sample (O)	Coefficient Sample (M)	Standard deviation	t-values	P-values	Decision
ATT- INT	0.269	0.274	0.082	3.299	0.001	Yes
PBC - INT	0.321	0.318	0.075	4.255	0.000	Yes
PE - INT	0.214	0.212	0.065	3.304	0.000	Yes
SN - INT	0.117	0.119	0.066	1.770	0.077	No

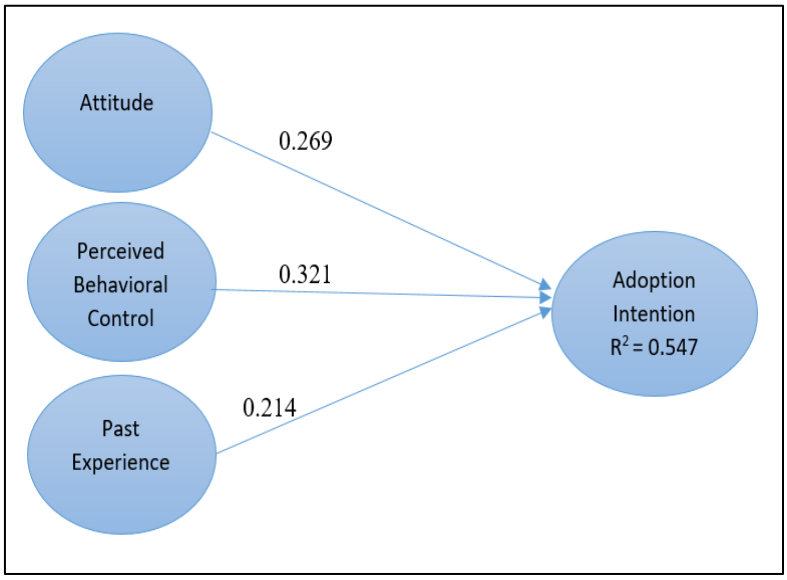

Fig. 2. Psychological determinants in influencing residents adoption intention of home energy efficiency measures

5. Discussion

This study investigated the psychological determinants in influencing residents' intention to adopt home energy efficiency measures. The results of the PLS-SEM analysis stated that attitude of residents has a significant influence on their intention to adopt home energy efficiency measures. This result is consistent with a statement by Ajzen [26] stated that someone who has a good attitude about an action is much more to perform it out. Similarly, these findings also align with Lin and Dong [19] who claims that consumer's purchase intention toward energy-efficient home appliances significantly impacted by their attitude. Besides, Wang *et al.,* [42] also argues that the attitude of the residents toward environment has significant impact on their energy-saving behavioral intention. Other than that, Wang *et al.,* [22] has also found attitude to be a significant determinant toward electricity saving behaviour. Moreover, this finding also supported by White and Hyde [18] and Tonglet *et al.,* [17] that claimed attitude act as a significant predictor of recycling intention.

Moreover, results also confirmed that perceived behavioural control is significant to Sibu resident's intention to adopt home energy efficiency measures. This finding signifies that when individual have better control over an energy saving measures, they are most likely to adopt it. This result is consistent with some previous studies [19-20,35] which point out that perceived behavioural control to be a significant determinant towards the intention on purchasing [19] and adopting energy efficient appliances [20] as well as expensive energy-efficient facilities [35]. Besides, according to the research carried out by Salim *et al.,* [23] in Pakistan, perceived behavioural control has significant impact on residents' intention to reduce the electricity use.

While the finding has also claimed that past experience on energy saving measures has a significant relationship in influencing the intention to adopt home energy efficiency measures. This finding confirms that when individual have past experience on energy saving measures, their intention to adopt home energy efficiency measures is higher. This result is aligned with the research carried out by Zografakis *et al.,* [27] which argues that individuals or homeowners who has already involved in some energy-saving measures or experienced power outages would be more concerned about the energy conservation. Besides, this finding also supported by White and Hyde [18]and Tonglet *et al.,* [17] who claim that past experience was indicated significant correlation with

household intention to perform recycling behaviour in Australia. Similarly, Xu *et al.,* [28] also points out that past experience has positive significant on consumer's waste separation behaviour.

At the same time, this study has showed that subjective norm of residents does not have a significant influence on their intention to adopt home energy efficiency measures. This result implies that residents in Sibu, Sarawak are not easily influenced by others opinion during their decision making in adopting energy efficiency measures. This mainly due to the higher prices of energy efficiency appliances compared to conventional appliances that might not be able to afford by the residents in Sibu, Sarawak. This will indirectly impact the intention to adopt home energy efficiency among the residents although advised by others peoples. Therefore, the effect of subjective norm in influencing the energy efficiency measures adoption intention at home is insignificant. This finding also supported by the Nguyen *et al.,* [43] which points out that consumer consumption behaviour towards energy saving home appliances does not impacted by subjective norm.

6. Conclusions

This research aims to determine the significance of the psychological determinants in influencing residents' intention to adopt home energy efficiency measures in Sibu, Sarawak. Theory of Planned Behaviour is adopted as a fundamental basis in determining the significance of the psychological determinants in influencing residents' intention to adopt home energy efficiency measures and including one additional variables which is past experience. A total of 286 completed questionnaires were gathered and all the collected data were analysed using frequency analysis and partial least square structural equation modelling (PLS-SEM). Based on the findings, the intentions among the residents in Sibu, Sarawak to adopt home energy efficiency measures significant impacted by their attitudes, perceived behavioural and past experiences. The findings will acts a guideline for the policymakers when formulating the policies and for the marketers when developing energy efficient appliances. The main limitation for this study is only focused on the residents in Sibu, Sarawak. Hence, this study was not comprehensive enough to cover all the residents in East Malaysia due to different perceptions across different region. Future research should focused on the residents in other city in East Malaysia such as Kuching and Miri in Sarawak and Kota Kinabalu in Sabah in order to gather their perception.

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