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# Key determinants of waste separation intention: empirical application of TPB

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## Abstract

**Purpose** – This study aims to identify the key determinants of waste separation intention among the students in Universiti Teknologi Malaysia (UTM).

**Design/methodology/approach** – This study adopted the theory of planned behaviour (TPB) as the fundamental framework. The key determinants of waste separation behaviour are attitude, subjective norm (SN) and perceived behavioural control. An elicitation survey has been conducted to explore the students' beliefs relative to waste separation behaviour. The empirical data collected were analysed using structural equation modelling (SEM) assisted by SmartPLS software.

**Findings** – The result shows that only two determinants are significant towards intention, attitude and perceived behavioural control, while SN is not. The results of the study are significant to the organisation, as an identification of the determinants that influence waste separation intention contributes to a more focused waste separation programme aligned to Malaysia's objective towards a sustainable developing country.

**Originality/value** – There are few studies on solid waste separation compared to food waste and industrial waste separation. The authors focus on the identification of the key determinants of solid waste separation intention among students. This study serves as an initial attempt to adopt the TPB in solid waste separation context, hence contributing to existing literature.

**Keywords** Structural equation modelling, Universities, Theory of planned behaviour, Waste management, Structural analysis, Waste separation

**Paper type** Research paper

## Introduction

Developing countries, including Malaysia, are faced with low quality of environment, especially in urban areas, with respect to the solid waste management sector (Khajuria *et al.*, 2010; Shamsuria *et al.*, 2011). As stated by Firdaus and Ahmad (2010), one of the factors



contributing to the low environment quality is inadequate and unscientific municipal solid waste management practice. Application of the 3Rs should be done in developing countries to improve solid waste management (Desa *et al.*, 2011; Badgie *et al.*, 2012). Badgie (2010) and Shamshiry *et al.* (2011) stated that Malaysia is also facing challenges in handling the increasing trend of solid waste generation owing to economic growth and increase in population and residents' attitudes, while Moh and Manaf (2014) add rapid urbanisation as a factor that contributes to solid waste management challenges. The Malaysian Government has launched various recycling programmes and campaigns and has provided solid waste facilities to improve the solid waste management sector, but the success rate is still low based on the increasing amount of waste generated from year to year (Solid Waste Corporation Management, 2015). This is because people are not practising waste recycling behaviour actively even though they have an understanding and awareness of the impact of improper waste management on the environment (Moh and Manaf, 2014; Omran *et al.*, 2009). Therefore, in the 11th Malaysia Plan, the government focused on changing the nation's behaviour in minimising waste through waste separation instead of providing extra landfill and dumping areas (Economic Planning Unit, 2016). Waste separation is one of the ways to reduce the amount of waste being dumped at the landfill and increase the recycling rate (Badgie, 2010; Poon *et al.*, 2001). In this RMK11, the government focus is on fostering waste separation behaviour in the society through comprehensive activities and a willingness to invest more, as the waste issue is at critical stage. Subsequently, the government came up with the A2 strategy in RMK11, which emphasises changing Malaysian behaviour, especially in waste separation, and was launched on 1st September 2015. A programme known as "Separation of Solid Waste at Source" was launched on 1st September 2015, to implement the mandatory separation of waste at source in a few Malaysian states. In addition to government efforts, research has also been conducted to contribute to reducing the amount of waste generated in the country. For example, a study conducted by Begum *et al.* (2006) emphasised on benefit – cost analysis of the economic feasibility of construction waste minimisation, that by Desa *et al.* (2011) focused on solid waste management and other research that focused on food waste separation (Eisted and Christensen, 2011; Ghani *et al.*, 2013; Knussen *et al.*, 2004; Pakpour *et al.*, 2014). Based on the literature, it is seen that little research has been conducted, whether in Malaysia or other countries, on solid waste separation compared to industrial waste separation, food waste separation and household waste separation. Therefore, the present study, in exploring the solid waste separation intention, will contribute to the existing solid waste separation literature.

Based on previous research, most of the waste management is handled by behavioural conduct. This indicates that improving human behaviour contributes to the success of a waste management programme. Therefore, improving human behaviour towards waste minimisation through waste separation is essential. To improve human behaviour, it is important to identify the key determinants of behaviour, because human behaviour can be improved or changed if the right determinants that formulate a specific behaviour are identified (Low, 2012; Wang *et al.*, 2011; Webb *et al.*, 2010). In the waste separation context, identifying the key determinants of waste separation behaviour is critical for sustainable behavioural change. By having the right key determinants of behaviour, the government can tailor more comprehensive strategies and programmes that will lead to behavioural change on waste separation, which will ultimately help the government achieve its objective of minimising waste. Therefore, it is important to find the right determinants in formulating the nation's waste separation behaviour effectively. This study aims to identify the key determinants of waste separation intention so that they can be used to foster waste separation behaviour among the nation as well as reduce the amount of waste generated,

which aligns with Malaysia's objective of achieving a sustainable developing country. The remainder of this paper is organised as follows: Section 2 presents the theoretical framework, which adopts the theory of planned behaviour (TPB) in a waste separation context; Section 3 describes the measures, procedures and partial least square – structural equation modelling; Section 4 reports the results, and, lastly, Section 5 contains discussion of the findings while a conclusion drawn from this study is given in Section 6.

### Theoretical framework

Waste should be separated before being recycled (Boldero, 1995; Ramayah and Rahbar, 2013). Therefore, waste separation comes at an early stage, before recycling, such as sorting out the waste into specific materials, which are paper, glass and plastics. Generally, solid waste is separated into different colours of bin according to its composition. However, waste separation is likely to be difficult, and several factors may have to be taken into consideration, especially having any intention to separate waste. Therefore, it is important to boost people's intention to separate waste for achieving success in any waste separation programme.

In identifying the factors that influence waste separation decisions, the TPB can be used, as it provides a systematic theoretical framework, and many previous studies have acknowledged that TPB is very useful in predicting the determinants of specific intention and behaviour (Ramayah *et al.*, 2012; Wan *et al.*, 2012). TPB has been widely used in investigating the relationship between various key determinants and action, especially in the pro-environmental behaviour context, which is successful and validated (Yazdanpanah *et al.*, 2015). For example, using TPB in recycling behaviour (Botetzagias *et al.*, 2015; Izagirre-Olaizola *et al.*, 2015; Chan and Bishop, 2013), electricity consumption behaviour (Tetlow *et al.*, 2015), organic food purchase behaviour (Yazdanpanah *et al.*, 2015) and green hotel choice (Nezakati *et al.*, 2015). Successful applications of the TPB across various pro-environmental behaviours can potentially reflect its potential in explaining waste separation intention. The TPB is a revised and upgraded derivation of the theory of reasoned action (TRA) and is a belief-based social cognitive theory (Downs and Hausenblas, 2005). According to Downs and Hausenblas (2005), the TPB explains that human expectations and values involving behaviour form their behavioural, normative and control beliefs. These will lead to intention and behaviour through their attitude, subjective norm (SN) and perceived behavioural control (PBC). Based on the TPB, the three determinants in performing behaviour are attitude towards behaviour, SN and PBC (Ajzen and Madden, 1986; Ajzen, 1991). The first determinant is the attitude towards behaviour, which will form the intention of an individual as to whether to participate in waste separation behaviour (Ajzen, 1991). Attitude is the determinant that demonstrates the overall evaluation of people towards a specific behaviour (Greaves *et al.*, 2013). A positive evaluation such as "waste separation will help in increasing the recycling rate" or "waste separation contributes to a cleaner environment", is likely to increase the intention to practise waste separation activities and, thus, this will lead to higher likelihood the individual to perform waste separation behaviour. In contrast, a negative attitude, such as "I feel that waste separation is wasting my time", will ultimately lead to a lower waste separation intention and behaviour.

The second determinant of waste separation intention is SN, which refers to social influence in influencing whether an individual will perform or refuse to perform the specific behaviour. According to Greaves *et al.* (2013), this determinant demonstrates the social pressure that motivates people to perform the desired behaviour. Based on the TPB, individuals will take action to separate waste if their important referents think they should participate in waste separation and vice versa. For example, "I think my friends at the university always want me to engage in waste separation activities" and "I think my lecturer will be happy to know I am practising waste separation behaviour". Such approval

perception from their important referents will contribute to a higher waste separation intention and behaviour. However, if their important referent makes the individual think that they disapprove of their action, students will be less likely to practise the specific action to separate waste, such as “My friends in the hostel will tease me if I put the waste into the bins according to its colour so as to separate waste”. Next, the third key determinant of waste separation intention is PBC, which concerns the individual’s confidence about being able to perform the behaviour or not. If the individual has high self-confidence in their ability to separate waste, it will increase their intention to perform waste separation. This also means that if the individual has low self-confidence in their ability to practice waste separation, they will not have the intention to perform it. This had been explained by Greaves *et al.* (2013) that PBC is the individual’s perception to perform a specific behaviour, and it is influenced by how difficult it is to perform it and the individuals perceive that they have control over the desired behaviour. For instance, a student who is confident that he could separate waste before throwing it away, possesses higher waste separation intention than one who does not believe that he will separate the waste before throwing it away, as he is a busy person. The student with higher confidence level is more likely to have an intention to perform waste separation than the latter. According to TPB, intention to engage in a behaviour will happen when people make a positive evaluation of the behaviour, if there is pressure from society and if they also believe that they have the opportunity to do so (Ajzen, 2005).

Various studies have been conducted to test the applicability of TPB across various types of behaviours. The most relevant are Mahmud and Osman (2010) who studied the determinants of recycling intention behaviour among Malaysian school students, and Wan *et al.* (2012) who conducted a study on recycling attitude and behaviour at a university campus in Hong Kong. Other than these, there are also a few studies that have adopted TPB in a recycling context, such as Ghani *et al.* (2013) on the influencing factors of participation in source separation of food waste; Izagirre-Olaizola *et al.* (2015) on internal determinants of recycling behaviour by university students; and De Leeuw *et al.* (2015) on the key beliefs underlying pro-environmental behaviour in high school students.

### Methodology

This study used structural equation modelling (SEM) technique assisted by SmartPLS to examine the causal relationship of the determinants towards waste separation intention among the students on campus. Two-step modelling was performed in this study. The first step is establishing the measurement model, whereby the measurement model is revised and confirmed. The second step is to test the structural model, whereby the causal relations among latent variables are modelled. TPB is adopted as the theoretical structure in this study. Based on the theoretical structure provided in TPB, three hypotheses are formulated:

- H1. Attitude has a positive influence on waste separation intention.
- H2. Subjective norm has a positive influence on waste separation intention.
- H3. Perceived behavioural control has a positive influence on waste separation intention.

### Research instrument

This study is a quantitative study using a survey design. The questionnaire was designed based on previous research that applied TPB in pro-environmental behaviour (Ramayah *et al.*, 2012; Tonglet *et al.*, 2004a; Yazdanpanah *et al.*, 2015) and the results from elicitation study. An elicitation study was conducted in Universiti Teknologi Malaysia (UTM) to gather information about the beliefs in the local context towards waste separation. The responses with high

frequency in the elicitation survey were used in constructing measures in the final questionnaire (Ajzen and Fishbein, 1980). Taking into account that the beliefs may be unique across various populations, sets of beliefs and salient referents need to be elicited in each new local context (Ajzen and Fishbein, 1980). The elicitation survey questionnaire forms are composed of two sections, including demographic descriptions of the respondents and nine open-ended questions to retrieve information on students' attitudes towards waste separation, consequences and the factors that would encourage and discourage their waste separation behaviour on campus. A few examples of questions included in the elicitation survey are: "what do you see as the advantage and disadvantage of performing waste separation practice on campus"; "what else comes to your mind when you think about practising waste separation on campus"; "please list the individuals or groups who would approve or disapprove of you performing waste separation practice on campus"; "please list any factors that would enable or prohibit you to perform waste separation practice on campus". In total, 100 copies of open-ended elicitation questionnaires were distributed to students at Universiti Teknologi Malaysia. A valid response rate of 89 per cent was captured. The beliefs and normative referents captured served as input to construct the final questionnaire.

The final questionnaire was composed of two sections, of which the first section was about respondent demographic profile and the second section was to assess students' attitude, SN and PBC towards the solid waste separation intention. The questionnaire consisted of 19 questions distributed into four dimensions: attitude (six questions), SN (three questions), PBC (six questions) and intention towards solid waste separation (four questions). All questions were randomly rotated to minimise systematic error. The questionnaire is a closed-ended questionnaire with the responses guided on a range of given scales. The reliability of the instrument is based on Cronbach's alpha value, which is 0.851. The components of the TPB (waste separation attitude, SN, PBC and intention) were measured using a five-point semantic differential scale. The questions were scaled from 1, indicating negative view towards waste separation, to 5, indicating a positive view towards waste separation. Table I shows the questionnaire items.

### *Subjects and procedure*

The respondent in this study are students from UTM. The scope selection is because UTM is one of the largest public universities in Malaysia, with a student population of about 24,000. The student group is the biggest group of campus community, who are living on campus, thus, reflecting them to be major contributors to the solid waste. Yazdanpanah *et al.* (2015) also stated that the students are more knowledgeable on pro-environmental issue compared to the general population in the university, as they obtain their education through the internet and from educators and peers. Hence, students are the targeted respondent group in this study. The questionnaire was distributed face-to-face to the students in the university after being revised based on comments from questionnaire pretesting. This study refers to Krejcie and Morgan (1970) in determining a sufficient sample to represent the population, which suggests the minimum sample required is 378. To get more generalised data for the present study, in total, 486 responses were gathered out of 500 questionnaires distributed. The overall response rate was 97.2 per cent. The samples chosen were based on convenience sampling method which was selected based on ease of access. Of the total of 486 respondents, half were male and half female. Fifty per cent of the respondents were undergraduate students and 50 per cent postgraduate students. According to the Department of UTM Student Affairs (2015), the educational qualification proportion as at October 2015 was reported to be about 47 per cent undergraduate students and 53 per cent postgraduate students. These statistics are not much in variance with the educational qualification proportion gathered in this study.

**Table I.**  
Questionnaire items

Latent variable	Item
Attitude	I believe that my waste separation behaviour will help to increase recycling rates
	I feel good about myself when I do waste separation
	I believe that my waste separation behaviour will help reduce waste management cost
	I believe that my waste separation behaviour will help reduce pollution and contribute to a cleaner environment
	I believe that my waste separation behaviour will help reduce wasteful use of landfills
Subjective norm	I feel that waste separation needs additional effort and it is time consuming
	My lecturers expect me to engage in waste separation behaviour
	My friends, whose opinions I value, would want me to engage in waste separation behaviour
Perceived behavioural control	My classmates expect me to engage in waste separation behaviour
	Waste separation is inconvenient
	I know how to separate my solid waste
	Waste separation is easy for me
	I am confident that, if I wanted to, I could separate the waste on a regular basis.
Intention	I know what items of solid waste should be separated
	Whether to separate the waste in my hostel or not is completely up to me
	I intend to separate the waste in my hostel on a regular basis
	I plan to separate waste if proper waste separation facilities are provided.
	I plan to separate the waste on a regular basis
	I am willing to separate waste if proper waste separation facilities provided

### Statistical analysis

For data analysis, the partial least square – structural equation modelling (PLS-SEM) analysis using SmartPLS version 3.0 software was used to examine the causal relationship between the student's attitude, SN and PBC and the student's intention in performing waste separation on campus. SEM is a second-generation analysis technique, and the purpose of using it in this study is because of its advantage against the limitation of first-generation regression analysis technique in measuring latent variables (Lehman, 1991). PLS-SEM allows researchers to simultaneously examine the validity of a latent variable with its associated indicators (measurement model) and the structural relationship among latent variables (structural model) (Hair *et al.* 2011; Hair *et al.*, 2012). Compared to the covariance-based SEM, PLS is less stringent. There is no data distribution assumption for PLS analysis techniques and it can work effectively with a small sample size of respondents (Hair *et al.*, 2011, 2012).

### Results and findings

There are two models involved in PLS-SEM analysis, namely, measurement model and structural model. The measurement model shows the relationship between a latent variable and its corresponding indicators, while the structural model demonstrates the relationship between different latent variables. Although PLS-SEM provides the advantage of testing both models simultaneously, we needed to access the models in stages. The validity and reliability of the measurement model were examined before checking the path-coefficient between latent variables for hypothesis testing on the relationship between student's attitude, SN and PBC and the student's intention in performing waste separation (Anderson and Gerbing, 1988). The results of the measurement model and structural model will be reported in the following subsection.

*Measurement model*

The validity and reliability of the measurement model are examined via composite reliability, convergent reliability and discriminant validity. Composite reliability is an internal consistency reliability. Its value is within the range of 0 to 1, in which a composite reliability value between 0.7 and 0.9 can be regarded as satisfactory (Nunally and Bernstein, 1994). The convergent reliability is examined with the indicator reliability and the average variance extracted (AVE) value. The indicator reliability is determined by loading an indicator to its corresponding latent variable, and a loading value higher than 0.708 indicates that the indicator is associated with its corresponding latent variable (Hair *et al.*, 2014). However, loading between 0.4 to 0.7 is only deleted if the deletion of item can increase the value of the composite reliability and AVE above their threshold value (Hair *et al.*, 2014). On the other hand, AVE reflects the variance of latent variable measurement items that are captured by the respective latent variable. It is recommended that the threshold value for AVE should exceed 0.5 (Fornell and Larcker, 1981). Lastly, the discriminant validity is measured with Fornell–Larcker’s criterion to confirm that a particular latent variable is different from others. The square root of AVE is calculated and the value of the square root of AVE should be the highest compared to the correlation with other latent variables (Fornell and Larcker, 1981). The value of all these criteria is computed with the PLS algorithm, performed using the SmartPLS version 3.0 software (Ringle *et al.*, 2014). The PLS algorithm stops at the maximum iteration number of 300, or at the stop criterion of 10E-5 (Hair *et al.*, 2014). The values of composite reliability, indicator loading and AVE are reported in Table II while Fornell–Larcker’s criteria are presented in Table III.

Following Hair *et al.* (2014), two items associated with attitude variable, one with SN variable and another two items with PBC variable have been removed owing to loading value below 0.4. Items with loading between 0.5 and 0.7 are retained, as the measurement model achieved the threshold value of composite reliability and AVE. Based on the results presented in Tables II and III, we conclude that the measurement model met the validity and reliability measurement criteria. The following section is to evaluate the structural model.

*Structural model*

The structural model is evaluated by examining the path coefficients, *t*-statistics and coefficient of determination ( $R^2$  value). The bootstrapping resampling procedure, with 486

Latent variable	Items	Loadings	Indicator reliability	Composite reliability	AVE
Attitude	ATT <sub>1</sub>	0.694	0.482	0.846	0.580
	ATT <sub>2</sub>	0.712	0.507		
	ATT <sub>3</sub>	0.783	0.613		
	ATT <sub>4</sub>	0.847	0.717		
Subjective norm	SN <sub>1</sub>	0.983	0.966	0.749	0.620
	SN <sub>2</sub>	0.522	0.272		
Perceived behavioural control	PBC <sub>1</sub>	0.713	0.508	0.825	0.543
	PBC <sub>2</sub>	0.843	0.711		
	PBC <sub>3</sub>	0.654	0.428		
	PBC <sub>4</sub>	0.725	0.526		
Intention	INT <sub>1</sub>	0.628	0.394	0.808	0.587
	INT <sub>2</sub>	0.797	0.635		
	INT <sub>3</sub>	0.856	0.733		

**Table II.**  
Validity and reliability results of measurement models



cases and 5,000 subsamples, was conducted to determine the path significance. The path significance is used to test the hypothesis formulated based on the model. Table IV shows the result of path coefficients, *t*-statistics and effect size ( $f^2$ ).

Table IV shows the results of the structural model path coefficient. Out of the three hypotheses proposed in this study, only two were accepted. Results shown in Table IV supported *H1* (attitude has a positive influence on waste separation intention) and *H3* (PBC has a positive influence on waste separation intention). For *H1*, the path coefficient is significant ( $\beta = 0.563, t = 12.586, p < 0.001$ ) with a large effect size ( $f^2 = 0.474$ ). Thus, this finding confirms that the attitude of waste separation will positively influence university students' intention to separate waste. For the PBC variable, the path coefficient ( $\beta = 0.267, t = 6.548, p < 0.001$ ) is confirmed with the finding that students' intention to conduct waste separation is determined by their ability to perform such a task. The effect of this path is moderate, with relatively low effect size ( $f^2 = 0.115$ ). The results show that *H2* (SN has a positive influence on waste separation intention) is rejected based on the insignificant value. Such findings indicate that groups important to a student, such as classmates, friends and lecturers, do not influence students' intention towards waste separation.

The next evaluation criterion is the  $R^2$  value. According to Hair *et al.* (2011),  $R^2$  values of 0.25, 0.50 and 0.70 can be interpreted as weak, moderate and substantial, respectively. Overall, the  $R^2$  value of behavioural intention ( $R^2 = 0.494$ ; adjusted  $R^2 = 0.491$ ) indicates that the moderate amount of variance in waste separation can be explained with attitude and PBC, with a negligible amount of variance explained by SN. This result indicates that TPB can only explain a moderate amount of variance in waste separation intention within the university environment (Figure 1).

**Discussion**

Overall results show that only two constructs (attitude and PBC) are significant predictors towards student intention to separate waste. Among the constructs, attitude is the strongest predictor towards waste separation intention among the students at UTM. Attitude has

Latent variable	ATTD	SN	PBC	INT
ATTD	<i>0.762</i>			
SN	0.394	<i>0.787</i>		
PBC	0.401	0.303	<i>0.737</i>	
INT	0.660	0.277	0.485	<i>0.766</i>

**Table III.**  
Fornell–Larcker's criteria

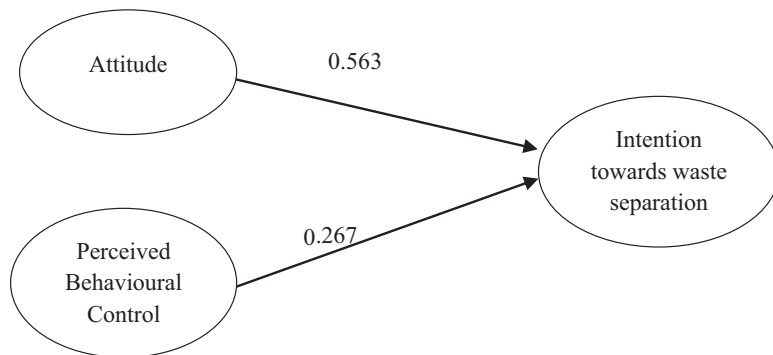
**Note:** Figures in italic are the square root of AVE

Path	Path coefficient ( $\beta$ )	<i>t</i> value	$f^2$ effect size	Hypothesis test result
ATTD → INT	0.563	12.586*	0.474	<i>H1</i> : Supported
SN → INT	-0.025	0.771	0.001	<i>H2</i> : Rejected
PBC → INT	0.267	6.548*	0.115	<i>H3</i> : Supported

**Table IV.**  
Significance testing results of the structural model path coefficient

**Notes:** \* $p < 0.001$ ; the value of effect size ( $f^2$ ) is determined by small (0.02), medium (0.15) and large (0.35) values (Cohen, 1988)

**Figure 1.**  
Key determinants of  
waste separation  
intention



been acknowledged as one of the significant predictors to influence intention to enact a desired behaviour. For example, a study conducted by Ghani *et al.* (2013) on source separation found that attitude has the strongest influence on intention. In addition, a study on recycling conducted by Arvola *et al.* (2008) had similar results, in that attitude is a significant predictor in predicting intention to purchase organic food. Some studies have also found attitude to be a significant determinant of waste separation intention, such as Pakpour *et al.* (2014), who found attitude as a significant predictor towards household waste separation, and also on recycling behaviour as found by Chan and Bishop (2013). This finding implies that a more positive evaluation of students' intention towards waste separation will increase the students' intention to separate the waste and, hence, potentially lead to waste separation behaviour. In the present context, the students were likely to separate the waste on campus when they perceived that such practice would help to reduce pollution and contribute to a cleaner environment, reduce waste management costs and increase the country's recycling rate. This finding also suggests that the UTM students, as respondents in this study, had an attitude which makes them feel good whenever they do the waste separation.

Additionally, the PBC was found to be positively and significantly correlated with the students' intention to perform waste separation on campus. The students were confident they could separate the waste if they wanted to. This finding demonstrates that students' higher confidence level to perform waste separation behaviour was associated with a higher waste separation intention. Additionally, the students did not agree on the waste separation practice, as it was taking up too much of their time or they considered it to be a waste of time. This result is consistent with that of some previous studies. For instance, Wan *et al.* (2012), who conducted a study on recycling attitude and behaviour on a university campus in Hong Kong, found that attitude and PBC influence recycling attitude. In a study on the influencing factors of participation in source separation of food waste, Ghani *et al.* (2013) also found PBC to be significant towards source separation behaviour.

Notably, this study has found that SN is an insignificant predictor to intention in the waste separation context. This finding is inconsistent with the original model of TPB, in which all three determinants are significant predictors of intention. However, such a finding is consistent with some previous studies, such as Ghani *et al.* (2013) on food waste separation, which found that SN is insignificant towards intention. In addition, a study by Bamberg *et al.* (2015) on determinants of participation intention in community-based pro-environmental initiatives also showed similar results to this study, whereby SN is not significant towards intention. Some previous studies found SN as the weakest predictor among all the determinants included in the model, as reported by Armitage and Conner (2001); for

example, a study by Tonglet *et al.* (2004a) on recycling behaviour and that by Davis *et al.* (2009) on sustainable attitude and behaviour. Overall, this finding suggests that students' intention to separate the waste is highly dependent on whether they want to do it and whether they are confident they can do it; it was not influenced by the opinions of the people who are important to them, such as classmates, lecturers and friends.

Additionally, multi-group analysis was also done to identify whether by attending any waste separation-related programme, students' waste separation intention will be influenced. The result suggests that PBC-INT is the only significant different path relationship between the group that had attended a waste separation-related programme and the group that had never attended any such programme. This is based on the path coefficient difference shown, wherein the value of PBC-INT is the highest among other determinants, at 0.246. In addition, if the  $p$ -value is smaller than 0.05 or larger than 0.95, it shows that the determinant is significant (Henseler *et al.*, 2009). Therefore, based on the result, significant  $p$ -value is only shown by PBC-INT and no other determinant. The  $p$ -value for PBC-INT is 0.028, while that for the ATT-INT and SN-INT is 0.720 and 0.417, respectively. This shows that, having knowledge about waste separation can increase the PBC towards waste separation intention. This is consistent with the study by Tonglet *et al.* (2004b) where awareness of how to recycle was significant towards PBC and correlated with intention.

## Conclusion

This research aims to identify the key determinants of waste separation intention among Universiti Teknologi Malaysia (UTM) students. The TPB is adopted as the fundamental theoretical structure in identifying the key determinants of waste separation intention, which are attitude, subjective norm (SN) and perceived behavioural control (PBC). An elicitation study was conducted among 89 students on campus to identify the beliefs and normative referents that served as input for the final questionnaire. Subsequently, a total of 486 empirical data gathered from final questionnaire survey was analysed using SEM analysis assisted by SmartPLS software. The results of analysis showed that the strongest predictor of student intention to separate waste on campus was attitude and PBC, while SN did not influence the intention to separate waste among the students. In essence, UTM's waste management system should focus on elements that can effectively inculcate pro-environmental behaviour among students, such as highlighting the benefits of waste separation, and by providing sufficient facilities to increase waste separation intention and foster desired behaviour. However, this study only focuses on students from UTM, not including other university community, such as support staff and academic staff. Therefore, the results only target and apply to the student community and cannot be generalised to other contexts. Similar methodology can be adopted for other university, as well as other context with relevant modification. Considering limited study had been conducted particularly on waste separation context in Malaysia, existing identification of the determinants that influencing waste separation intention could add value to the existing theory by demonstrating its applicability in waste separation context. In addition, this research uses self-reported data, as it is a social science research. This may give biased answers during data collection. Lastly, it is recommended to include some other additional determinants in future study appropriate to the local context.

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