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RESEARCH ARTICLE

CAMPUS SUSTAINABILITY: EXPLAINING STUDENTS' RECYCLING BEHAVIOUR USING THE TPB-MORAL NORM FRAMEWORK

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ABSTRACT - The campus sustainability initiatives, including recycling, has become increasingly important for higher education institutions that aspire to be recognized in UI GreenMetric World University Rankings such as Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA). Hence, this study aims to enhance theoretical understanding of in-campus recycling practice and provide practical insights for effective communication and intervention strategies. The Theory of Planned Behavior was adopted to examine factors influencing UMPSA students' engagement in recycling activities. A set of survey questionnaire form was utilized to collect quantitative data from a diverse sample of diploma, undergraduate, and postgraduate students at UMPSA. From the survey, 320 eligible respondents were successfully acquired and further analysed using IBM SPSS and SmartPLS 4. Ethical considerations (moral norms) and ease of recycling activities (perceived behavioural control) played a crucial role in determining UMPSA students' intention to engage in recycling practices. The insights gained can guide interventions and educational programs to promote sustainable practices on campus. Future research could explore contextual nuances, like cultural or institutional factors at UMPSA, affecting recycling behaviour. Investigating intervention strategies to enhance moral norms, perceived behavioural control, and recycling intentions would further enrich sustainability initiatives at the university. The study sets the foundation for future research aiming to advance understanding and promote sustainable practices among university students.

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INTRODUCTION

Higher education institutions, such as universities, often lead sustainability initiatives because they are widely regarded hubs of community knowledge and reference (Tangwanichagapong et al., 2017). These institutions have a documented history of engaging in sustainability efforts spanning several decades (Mason et al., 2003). One significant aspect of these initiatives is the proactive promotion of campus recycling among key stakeholders. Among these stakeholders, students, typically young people, play a crucial role and are heavily invested in campus sustainability issues. University students, predominantly from the Millennial generation, are frequently labelled the "green generation" due to their strong environmental consciousness and enthusiasm for using eco-friendly goods and services (The Nielsen Global Survey of Corporate Social Responsibility and Sustainability, 2018).

In Malaysia, campus sustainability has been the main agenda for excellence at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) since 2017 (Faizal, 2018). Since then, UMPSA has actively pursued inclusion in the UI GreenMetric World University Rankings. This evaluation assesses the university's efforts to address environmental sustainability across six criteria: setting and infrastructure, energy and climate change, waste management, water usage, transportation, and education (Office UI GreenMetric, 2024b). UMPSA has demonstrated significant progress, improving its ranking from #128 to #103 and, most recently, to #68 between 2021 and 2023 (Abdul Wahit, 2023a; Office UI GreenMetric, 2024a). This achievement positions UMPSA as the fifth-best university in Malaysia and the top-ranking university within the Malaysian Technical University Network (MTUN).

To maintain and further improve its ranking, UMPSA has launched eight campus sustainability campaigns aimed at instilling environmentally responsible behaviour among students and staff. These initiatives include encouraging students to stay hydrated, bring their water bottles or containers, reduce waste, adopt healthy lifestyles, separate organic waste, repurpose waste into sustainable resources, use carbon-free transportation, and participate in on-campus recycling activities (Mohammad Idris, 2023). Campus recycling, identified by Chaplin and Wyton (2014) as a primary indicator of students' engagement in sustainable behaviour, serves as the first step towards fostering a culture of sustainability. Therefore, this paper aims to identify the status of recycling practices among UMPSA students and examine the factors influencing their engagement in such behaviour. To achieve this, the study adopts the Theory of Planned Behaviour (TPB) (Ajzen, 1991) as a framework, given its extensive use in analysing individuals' involvement in various behaviours, including recycling.

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However, the application of TPB in recycling studies often involves the incorporation of additional variables to provide a more comprehensive explanation of the behaviour being studied (Botetzagias et al., 2015). Commonly integrated variables include perceived convenience, consequence awareness (Gonul Kochan et al., 2016; Wan et al., 2012), situational factors, past behaviour (Botetzagias et al., 2015; Jamil et al., 2021; Sulaiman et al., 2019) and moral norm (Botetzagias et al., 2015; Chan & Bishop, 2013; Juliana et al., 2022; Wan et al., 2012). Nevertheless, the moral norm is considered special as Icek Ajzen himself emphasised that it might significantly contribute to explaining the behaviour variance in the early formulation of TPB (Ajzen, 1991; Botetzagias et al., 2015). Therefore, this study incorporates moral norm into the framework to examine the on-campus recycling practice among students.

Despite numerous studies conducted within the UMPSA context on recycling and waste management practices, there is a scarcity of research specifically focusing on this topic from the perspective of human behaviour (UMPSA-IR, 2024). This gap is significant, considering that recycling practices are fundamental to campus sustainability, with students playing a crucial role in ensuring the success of sustainability initiatives. While considerable research on recycling practices has been carried out in other Malaysian universities such as Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Malaya (UM), Universiti Putra Malaysia (UPM), Universiti Kebangsaan Malaysia (UKM), and International Islamic University Malaysia (IIUM) (Jamil et al., 2021), and Universiti Teknologi Malaysia (UTM) (Thoo et al., 2022), Universiti Malaysia Terengganu (Muniandya & Anuara, 2020), Universiti Teknologi MARA (Mohamad Yusof et al., 2023), as well as Universiti Utara Malaysia (Osman et al., 2014), specific investigations into recycling practices among UMPSA students remain lacking. Thus, this study addresses this gap by delving into the intricacies of recycling behaviour among UMPSA students, adding insights and empirical evidence on recycling practice in higher education institutions from diverse settings.

Research objectives

Based on the phenomenon of interest addressed, this paper outlines the following research objectives:

1) To measure the level of recycling practice among UMPSA students.
2) To evaluate factors influencing intention and, consequently, recycling practice among UMPSA students based on the TPB framework.
3) To assess how moral norm influence the recycling intention of UMPSA students and, subsequently, their recycling practices.

LITERATURE REVIEW

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) was developed by Icek Ajzen, a social psychologist professor. This theory posits that individual behaviour is driven by behavioural intentions. These intentions, in turn, are influenced by an individual's attitude towards the behaviour, the subjective norm surrounding the performance of the behaviour, and the individual's perception of the ease with which the behaviour can be performed (behavioural control) (Ajzen, 1985). Originally, the TPB evolved from the Theory of Reasoned Action (TRA), which was introduced by Fishbein and Ajzen (1975). Perceived behavioural control was added to the TRA to account for actions over which a person may exercise self-control, thus giving rise to the TPB. The TPB has been utilised in numerous previous studies focusing on various sustainable and environmental-related behaviours. These include examining purchasing behaviour concerning green products (Armutcu et al., 2023), consumption of green services (Fauzi et al., 2022), environmental knowledge sharing (Abd-Mutalib et al., 2023), and sustainable entrepreneurship (Srivastava et al., 2023).

Recycling Practice and Intention to Recycle

According to the TPB, behaviour refers to any action performed by an individual (Ajzen, 1985). It may encompass a wide range of activities, from daily routines such as eating, sleeping or working to more complex decisions to engage in positive or negative behaviours. Negative behaviours studied within the TPB framework include sharing fake news (Pundir et al., 2021), using pirated e-textbooks (Hati et al., 2020), and academic misconduct (Stone et al., 2009). Conversely, examples of positive behaviours involve quitting smoking (Saleem et al., 2023), whistleblowing on fraud (Sarikhani & Ebrahimi, 2022), and recycling (Jamil et al., 2021; Thoo et al., 2022).

Measuring recycling practice involves observing and recording students' actual engagement in recycling activities. This may include sorting and properly disposing of recyclables, utilizing designated recycling bins, participating in campus recycling programs, and adhering to recycling guidelines (Cho, 2019; Juliana et al., 2022). The assessment of recycling practice provides valuable insights into how students translate their intentions to recycle into actual behaviours.

Behavioural intention, on the other hand, refers to an individual's readiness or willingness to engage in a specific behaviour (Ajzen, 1985). This paper represents students' subjective probability that they will perform the behaviour in question, which is recycling practice. Measurement items include students' beliefs about the importance of recycling, willingness to make extra efforts in waste separation, plans to actively participate in campus recycling efforts, and incorporating recycling into their routine (Cho, 2019; Juliana et al., 2022). In campus recycling studies, behavioural intention (recycling intention) is often found to be an influential determinant of actual behaviour (recycling practice). For

instance, Thoo et al. (2022) reported that recycling intention positively influenced students to adopt recycling practices in a local university, while Wan et al. (2012) and Gonul Kochan et al. (2016) provided similar evidence for universities abroad. Hence, the following hypothesis is proposed: *Intention to recycle positively influences recycling practice (H5).*

Attitude towards Recycling Practice

Human behaviour and attitude are interconnected, with attitude being dependent on the presence of other elements. Ajzen (2011) defines attitude as how individuals positively or negatively evaluate a particular behaviour. A positive attitude would typically motivate someone to act in a certain way. In this study, attitude is understood as how UMPSA students evaluate recycling practices. This variable is measured based on students' perceptions of the extent to which they feel positive about themselves when recycling, their sense of responsibility to participate in on-campus recycling efforts, the ease of access to recycling facilities, and the effectiveness of on-campus recycling programmes.

Most previous studies done on on-campus recycling, regardless of the settings and statistical techniques used, consistently reported a positive influence of attitude on the intention to recycle. For example, Cho (2019) and Jamil et al. (2021) employed covariance-based structural equation modelling (CB-SEM) to estimate the effect of attitude on recycling intention. Both studies found a statistically significant positive effect of attitude on recycling intention at $p < 0.001$. Additionally, Thoo et al. (2022), who employed partial least square structural equation modelling (PLS-SEM), and Mohamad Yusof et al. (2023), who utilized multiple linear regression (MLR) also found a positive effect of attitude on recycling intention at $\beta = 0.253$, $p = 0.001$, $t = 3.246$ and $\beta = 0.336$, $p < 0.001$, $t = 4.466$ respectively. Only a study conducted by Sulaiman et al. (2019), who also employed MLR, found a non-significant effect of attitude on recycling intention at $\beta = 0.105$, $p = 0.077 > 0.05$. Therefore, it is more relevant to hypothesize that *Attitude has a positive influence on the intention to recycle (H1).*

Subjective Norm

Subjective norm are social constraints that involve how individuals perceive the expectations of others and the importance they attach to these expectations (Ajzen, 1991). When a person is aware of a particular social standard and chooses to adhere to it, subjective norm come into play. These norms also influence individuals to act in a specific way by aligning with both normative and empirical expectations. When perceived behavioural norms exist within a group, individuals are influenced by those norms. For instance, individuals are more likely to engage in recycling activities when they observe others doing so (Miliute-Plepiene et al., 2016). In this study, subjective norm refer to UMPSA students' perception of whether important people in their lives expect them to practice recycling. These influential figures in their student life journey are not limited to family members but also include friends, lecturers, and even university management.

Out of five similar studies conducted by prior researchers, two studies found that subjective norm did not significantly influence recycling intention at $p > 0.05$ (Cho, 2019; Jamil et al., 2021). Both studies employed CB-SEM as the data analysis technique. Meanwhile, the remaining three studies found that subjective norm have a positive influence on recycling intention. Both Sulaiman et al. (2019) and Mohamad Yusof et al. (2023) utilized MLR to test the hypothesis and reported the results of $\beta = 0.153$, $p = 0.022$ and $\beta = 0.464$, $p < 0.001$, $t = 6.971$ respectively. Another study by Thoo et al. (2022), who employed PLS-SEM, reported a positive influence of subjective norm on recycling intention at $\beta = 0.223$, $p < 0.04$, $t = 2.659$. Nevertheless, it is still reasonable to hypothesize that *Subjective norm have a positive influence on the intention to recycle (H2).*

Perceived Behavioural Control

Perceived behavioural control refers to the level of confidence an individual has in their ability (or difficulty) to successfully carry out a particular behaviour (Ajzen, 1991). Expanding on this concept, it can be argued that having greater control over a behaviour reflects the ease of performing that behaviour (Juliana et al., 2022). Therefore, this study considers perceived behavioural control as UMPSA students' ability to engage in recycling practices successfully. Perceived behavioural control is thus measured in terms of their freedom to decide when and how to recycle, their confidence in effectively recycling used products, and their belief in possessing the necessary knowledge and control over recycling activities.

Previous similar studies have reported both significant and non-significant influences of perceived behavioural control on recycling intention. Sulaiman et al. (2019) and Mohamad Yusof et al. (2023), who utilised MLR, found non-significant results at $p > 0.05$. Conversely, results from CB-SEM (Cho, 2019) and PLS-SEM (Thoo et al., 2022) analyses demonstrated a significant influence of perceived behavioural control on recycling intention at $\beta = 0.230$, $p < 0.001$ and $\beta = 0.303$, $p < 0.001$ respectively. Despite the contradictory findings with an equal number of pieces of evidence regarding the influence of perceived behavioural control on recycling intention, this study follows the TPB common assumption and opts to hypothesise that *Perceived behavioural control has a positive influence on intention to recycle (H3).*

Moral Norm

Moral norm refers to beliefs about moral standards, ethical concerns and social responsibility in performing a particular behaviour (Chen & Lee, 2020; Wan et al., 2012). Specifically in the context of the present study, the moral norm is perceived as UMPSA students' ethical concerns, moral standards, and social responsibility to practice recycling. Measurement items used to assess this variable were adapted from Juliana et al. (2022) and Wan et al. (2012) include the

strength of students' moral duty, feelings of moral guilt about harming the environment, ethical responsibility to set a good example for others, and alignment with their personal moral values.

Regardless of the settings and statistical techniques used, previous studies on campus recycling consistently reported a positive influence of moral norm on the intention to recycle. For example, Chan and Bishop (2013) and Botetzagias et al. (2015) employed CB-SEM to estimate the effect of moral norm on recycling intention. Both studies found a statistically significant positive effect of moral norm on recycling intention at $\beta = 0.330$, $p < 0.05$ and $\beta = 0.241$, $p < 0.001$ respectively. Additionally, Wan et al. (2012), who employed PLS-SEM, also found a positive effect of the moral norm on recycling intention at $\beta = 0.125$, $t = 2.163$. Hence, it is certain to hypothesize that *Moral norm has a positive influence on the intention to recycle (H4).*

RESEARCH FRAMEWORK

Based on the hypotheses proposed in the Literature Review section, a research framework establishing a direct sequential relationship between variables under study is presented in Figure 1.

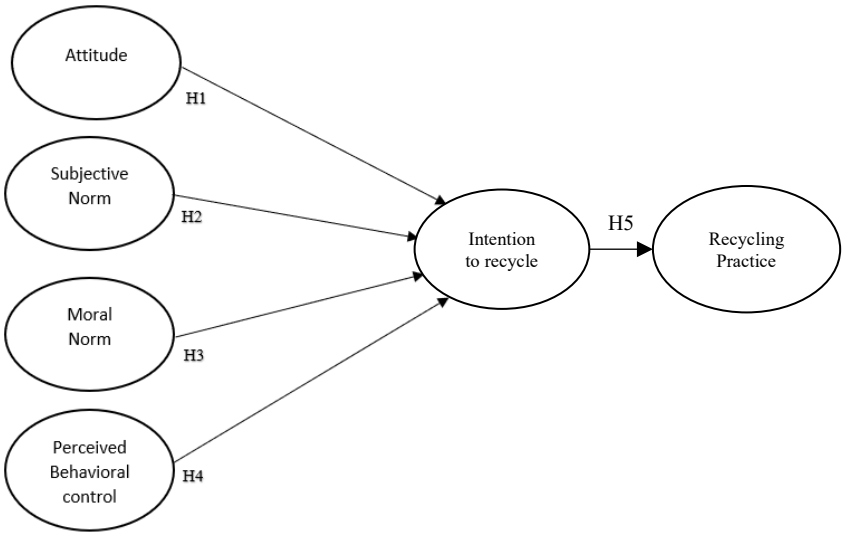

Figure 1. TPB-Moral Norm recycling practice framework

Figure 1 illustrates the research framework of this study, founded on the Theory of Planned Behaviour (TPB), with the addition of an external variable named moral norm to examine factors influencing UMPSA students' intention to adopt recycling practices and their actual adoption. In this framework, intention to recycle serves as the independent variable, and recycling practice is the dependent variable. Meanwhile, four antecedents, namely attitude towards recycling, subjective norm, moral norm, and perceived behaviour control, are linked to the intention to recycle. Antecedents, or antecedent variables, are variables that precede the independent variable being studied and influence the relationship between independent and dependent variables (Statistics How To, n.d.; Zach, 2020). Therefore, this framework suggests that attitude towards recycling, subjective norm, moral norm, and perceived behaviour control would influence the samples' intention to recycle, and their intention to recycle would influence their recycling practice.

METHODOLOGY

In the effort to enhance UMPSA campus sustainability, this study adopts a survey research design aimed at gathering quantitative primary data to explain the implementation of recycling practices among UMPSA students. A survey is the appropriate research design for an explanatory study, as advocated by prominent business research scholars (Bougie & Sekaran, 2020; Creswell & Creswell, 2023; Saunders et al., 2023). The foundation of the survey instrument (questionnaire items) was adapted from the work of prior scholars, including Juliana et al. (2022) and Cho (2019). This survey instrument strategically employs a 7-point interval scale for the dependent variable and a 5-point interval scale for the independent variable to prevent straight-lining responses (Hair et al., 2022) and common method bias (Jordan & Troth, 2020) in the research data collected. This survey questionnaire was electronically designed using the Google Forms platform to streamline the data entry process after data collection.

Population, Sampling Design and Eligible Respondents

A population in research is the total collection of people, things, or events that the researcher is interested in and that share some trait, while a sample is a subset of the population (Creswell & Creswell, 2023). In this study, the research population comprises UMPSA students, regardless of faculties, academic programs, and study modes, as well as local and international students within the university community. According to the QS Top Universities website, the total number of students at UMPSA is 8,331 (Quacquarelli Symonds, 2024). However, only students who have practised

recycling on the UMPSA campus were selected as the samples for this study. This approach aligns with a purposive sampling design, where samples are drawn from the population based on specific criteria (Bougie & Sekaran, 2020) to uphold the integrity and relevance of the data collected. This stringent selection ensures that the questionnaire would be completed by eligible individuals with actual recycling experience, thereby enhancing the credibility of the findings. Additionally, voluntary sampling was employed as eligible respondents were acquired based on their willingness to complete the electronic questionnaire distributed through various social media platforms (Murairwa, 2015).

Sample Size Determination

G*Power calculator (Faul et al., 2009) was used to calculate the minimum required sample size for this study. G*Power is frequently used to help quantitative researchers determine the minimum required sample size depending on the model complexity and required statistical power (Memon et al., 2020; Osman et al., 2023). With the maximum predictor of four variables (attitude, subjective norm, moral norm and perceived behavioural control), an effect size of 0.15, a statistical power of 80%, and a 5% probability of error for behavioural science research, the minimum required sample size was established at 85. Despite the calculated minimum sample size of 85, the study aimed to obtain a more extensive sample and reach as many respondents as possible to increase the generalizability of the findings.

Data Collection Procedure

The data collection procedure was administered through various online platforms such as WhatsApp, Telegram and Facebook, acknowledging the pervasive digital presence of the target audience. This multi-platform approach is designed to capture a diverse and representative sample of UMPSA students, considering potential variations in online platform preferences among the student community. The decision to leverage these platforms reflects an understanding of the dynamic and interconnected nature of social media, providing an accessible and convenient avenue for student participation. Regarding temporal considerations, the data collection period is confined to a cross-sectional timeframe of three months. This deliberate timeline balances acquiring an adequate sample size and meeting the research completion milestone. The concise duration ensures the timeliness and relevance of the data collected, providing a recent snapshot of the recycling behaviour of UMPSA students. The systematic approach to questionnaire design, participant eligibility criteria, and online distribution channels collectively contribute to a methodologically rigorous investigation into recycling practices among UMPSA students.

RESULTS

Profile of Respondents

A total of 322 respondents were initially obtained. However, two respondents were identified as non-eligible since they had never engaged in recycling but had still completed the survey form. After excluding this non-eligible respondent, the final dataset for analysis consisted of 320 respondents. Upon examination of the demographic composition, it was observed that approximately 53.6% of the survey participants identified as female, while the remaining 46.4% identified as male. Regarding academic program level, the majority (96%) were undergraduate students, with 3.7% being diploma students and 0.3% pursuing postgraduate studies. Further exploration of the participant distribution across campuses revealed that 49.2% were from the Gambang campus, and the remaining 50.8% were from the Pekan campus. These demographic details provide a snapshot of the diverse participant characteristics in terms of gender, educational background, and campus affiliation, contributing to a comprehensive representation of the study population.

The Level of Recycling Practice among UMPSA Students

To fulfil the first objective of this study, descriptive analysis was performed to measure the level of recycling practice among UMPSA students. Utilising the trichotomising formula introduced by De Vaus (2002), the mean score of recycling practice is categorised as follows: 1.000 to 4.800 is considered low, 4.601 to 6.000 is moderate, and 6.001 to 7.000 is deemed high. The result of the descriptive analysis revealed that the mean score of recycling practice among UMPSA students is 5.776. Hence, it is considered at a moderate level and indicates room for improvement in enhancing campus sustainability. The mean score also aligns with the categorical data acquired from the respondents, which recorded that the majority of respondents indicate they recycle used products sometimes; 10-20 times (33.6%), followed by occasionally recycle; 5 to 10 times (24.3%), rarely recycle; 1 to 5 times (20.6%), frequently recycle; more than 20 times (13.4%) and regularly recycle; almost every day (7.8%) since they started study in UMPSA.

Reliability and Validity of Constructs

In Structural Equation Modelling (SEM), whether using CB-SEM or PLS-SEM, the initial step before testing hypothesized relationships is to conduct a construct validity test through measurement model assessments (Hair, Black, et al., 2019). In PLS-SEM, this assessment involves outer loadings, internal consistency reliability through composite reliability coefficient (rho c), convergent validity through the average variance extracted (AVE) statistic, and discriminant validity through the HTMT ratio (Becker et al., 2023). Figure 2 illustrates the measurement model of this study.

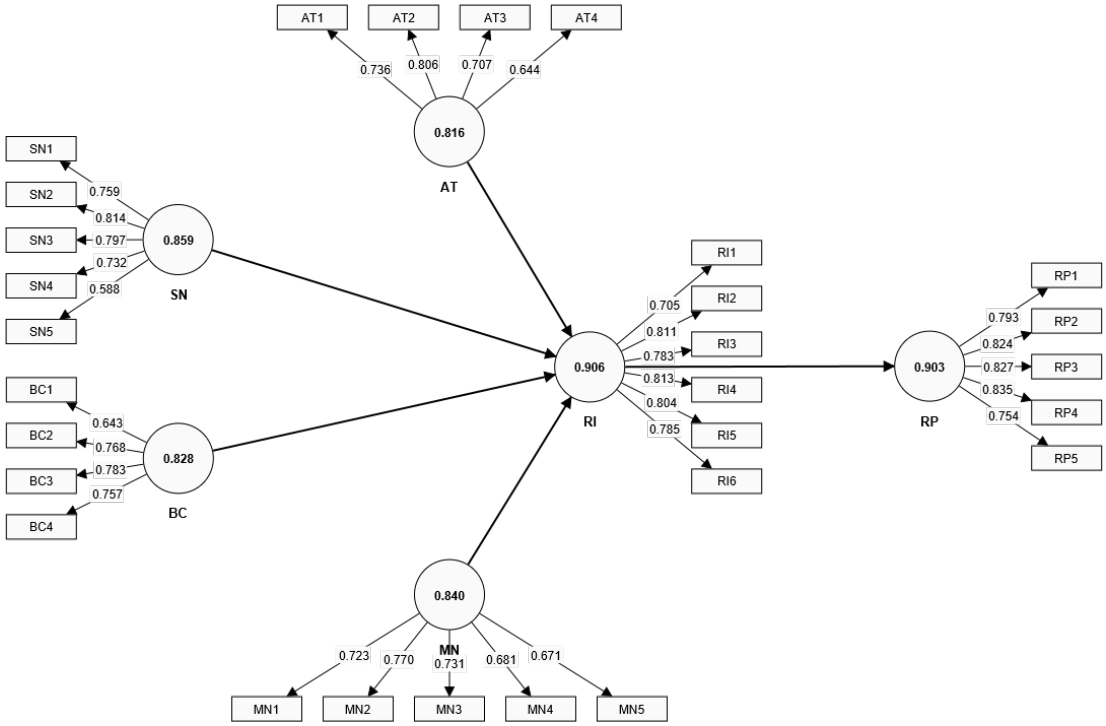

Figure 2. TPB-Moral Norm measurement model

Note. AT = Attitude towards recycling, SN = subjective norm, BC = perceived behavioural control, MN = moral norm, RI = recycling intention and RP = recycling practice.

Figure 2 illustrates the measurement model of this study. There are six latent variables (constructs) and 29 observed variables (indicators). Figures inside the construct represent rho c coefficients, while figures on the arrows represent outer loadings. The initial step involves assessing the loading of the indicators, specifically the outer loadings. An acceptable threshold for outer loadings is 0.5, provided that the construct meets the convergent validity requirement of an AVE of 0.5 and above (Byrne, 2016). In this case, the AVE for all constructs exceeded the 0.5 threshold after excluding an item from AT (i.e., AT5). Additionally, the internal consistency reliability for all constructs met the rho c threshold at 0.7 (Hair et al., 2022), with its readings ranging from 0.816 to 0.906. Simultaneously, the HTMT ratio is assessed to determine the discriminant validity between the constructs under study. The divergence and correlation between different constructs must be minimally correlated, with an HTMT ratio below 0.85 (Ramayah et al., 2018) or at least below 0.90 (Franke & Sarstedt, 2019). The result showed that the HTMT ratios for all constructs range between 0.325 and 0.819, thus meeting the discriminant validity requirement.

Table 1. Convergent and discriminant validity results

Constructs	Convergent	Discriminant (HTMT ratio)					
	(AVE)	RP	RI	AT	SN	BC	MN
RP	.652						
RI	.615	.732					
AT	.527	.324	.470				
SN	.551	.456	.451	.679			
BC	.547	.506	.628	.803	.715		
MN	.513	.325	.325	.773	.706	.819	

Hypothesis Testing

In the second phase of the analysis, structural model assessment via bootstrapping procedure was conducted to determine the significance of the hypothesised relationships. According to Hair et al. (2022), a rigorous reporting of structural model results involves the inclusion of collinearity statistics (VIF), path coefficient (β), t-values, p-values, confidence intervals (CI), and effect sizes (f^2). Hence, this study follows such recommendations and summarizes the results in Table 2.

Table 2. Hypothesis testing results

Hypotheses	VIF	β	SD	t -value	CI		f^2	Results
					LL	UL		
H1: AT → RI	1.741	.077	.071	1.094	-.044	.189	.005	Not supported
H2: SN → RI	1.653	.103	.069	1.492	-.013	.215	.009	Not supported
H3: BC → RI	1.901	.325	.068	4.804***	.210	.431	.078	Supported
H4: MN → RI	1.915	.127	.065	1.942**	.021	.235	.021	Supported
H5: RI → RP	1.000	.643	.050	12.782***	.551	.717	.705	Supported

Note. VIF = variance inflation factor, SD = standard deviation, LL = lower limit, UL = upper limit
**$p < .005$, ***$p < .001$ at one-tailed test

Prior to interpreting the significance of the tested hypotheses, an assessment of collinearity statistics should be conducted. The standard threshold for the VIF statistic to pass the collinearity assessment is less than 5. As a result, all VIF values recorded in Table 2 are below 5. Thus, the collinearity issue would not threaten the credibility of the structural model results. Then, regarding the significance of the hypothesised relationships, three out of five tested hypotheses were supported. The results revealed significant positive influences of perceived behavioural control and moral norm on recycling intention, with $\beta = 0.325$, $t = 4.804$ and $\beta = 0.127$, $t = 1.942$, respectively. Additionally, it was evident that recycling intention positively influenced recycling practice, with $\beta = 0.643$, $t = 12.782$. The range between confidence intervals' upper limit and lower limit values also supports the significance of this relationship, with both values being positive and not including 0 in the range. The significant relationships also revealed at least a small effect, with f^2 values ranging from 0.021 to 0.705. Thus, it supports H3, H4, and H5. A study by Wan et al. (2012) at a public university in Hong Kong also produced similar results. These statistical results show that UMPSA students' ability to successfully engage in recycling practices and their ethical concerns, moral standards, and social responsibility to practice recycling are what motivate them to engage in recycling activities and subsequently actually do it.

On the other hand, attitude towards recycling and subjective norm did not statistically influence UMPSA students' intention to engage in recycling activities at $t < 1.645$ (in a one-tailed test). This means that students' positive evaluation of recycling and expectations of people important in their lives did not lead them to engage in on-campus recycling activities. Thus, H1 and H2 were not supported. Sulaiman et al. (2019) also reported the non-significant influence of attitude on recycling intention among UTHM students. Meanwhile, Jamil et al. (2021) and Cho (2019) also found that subjective norm did not influence recycling intention in their study at six Malaysian public universities (UTM, UTHM, UM, UPM, UKM, and IIUM) and a public university in the southeastern USA, respectively.

Model's Explanatory and Predictive Power

Finally, the last phase of the analysis involves the evaluation of the structural model's explanatory power (R^2) and predictive power (Q^2 predict) using the PLS Algorithm and PLSpredict procedures. Explanatory power is computed based on in-sample estimation, while predictive power is computed based on an out-of-sample estimation field (Hair et al., 2019; Ramayah et al., 2018). Hence, both statistics complement each other. The results are summarised in Table 3.

Table 3. Explanatory power and predictive power results

Indicators	R^2	Q^2predict	PLS-SEM RMSE	LM RMSE	PLS-SEM RMSE – LM RMSE
RP1			.842	.852	-.010
RP2			1.070	1.071	-.001
RP3	.412	.156	.924	.962	-.038
RP4			.968	.996	-.028
RP5			.881	.904	-.023

Note. RMSE = root mean square error, LM = linear model

The results of the model's explanatory power, indicated by the coefficient of determination, R^2, revealed that the explanatory power is at a moderate level, following the threshold suggested by Chin (1998). This categorises R2 as weak if it equals 0.19, moderate if it equals 0.33, and substantial if it equals 0.67. Meanwhile, the result for the model's predictive power is interpreted following Shmueli et al. (2019) guidelines. These note that the Q^2predict value should be more than 0, and PLS-SEM RMSE values should be less than LM RMSE values to indicate that the prediction errors produced in PLS-SEM are less than the LM (standard regression) output, thus indicating better accuracy. When all indicators of the key endogenous construct (in this study, RP) showed PLS-SEM RMSE values less than LM RMSE values, it indicates that the predictive power of the model is high.

DISCUSSION

Results from the statistical analysis suggest that perceived behavioural control and moral norms are significant factors that influence UMPSA students' intention to recycle and, consequently, to do it. This indicates that UMPSA students' ability to engage in recycling activities, as well as their moral standards and social responsibility, trigger their intention to recycle and subsequently implement it. Compared to studies on campus recycling conducted in other local university settings that analyse behavioural intention as the dependent variable (Jamil et al., 2021; Mohamad Yusof et al., 2023; Sulaiman et al., 2019; Thoo et al., 2022), this study provides more evidence of the factors contributing to university students' involvement in recycling activities. By analysing students' actual behaviour in recycling as the dependent variable, the data used to produce the results were obtained from students who truly implement recycling. Thus, it reflects the actual scenario that is currently happening in UMPSA.

Key findings from the study indicate two influential factors shaping UMPSA students' intention to engage in recycling practice: perceived behavioural control and moral norms. Hence, to enhance recycling behaviour on campus and make it a regular habit, intervention efforts directed to increase students' behavioural control and instil their moral norms should be devised to ensure that students continue to practice recycling activities and even increase their efforts in the future. Findings from the descriptive analysis have reported that current recycling practice is still moderate (mean = 5.8), and most respondents only recycle used products sometimes (10-20 times). Therefore, the mission is to achieve the level where students regularly recycle (almost every day) since people dispose of garbage from their personal space nearly every day. The current percentage of respondents who regularly recycle is only about 8%.

Intervention efforts, such as improving recycling infrastructure by placing additional bins in high-traffic areas and implementing a clear schedule for efficient waste collection, contribute to students' behavioural control over recycling. For instance, placing recycling bins near student residences and classrooms ensures easy access, fostering a sense of control over their recycling habits. Additionally, assigning students to groups monitored by university staff, such as academic advisors, to demonstrate the proper use of recycle bins located all over the campus with a weekly duty roster to fill and empty the bins, as well as engaging with the nearest recycling centre for the ultimate recycling process, can be effective. Such interventions can empower students with knowledge, strengthening their behavioural control by providing hands-on experience in handling recycling procedures properly and seriously. Meanwhile, interventions to shape a positive moral norm among UMPSA students involve highlighting socially commendable recycling behaviours. For instance, launching a university-wide event recognising and celebrating groups of students who demonstrate a serious commitment to recycling can disseminate environmentally concerned norms within the campus. By publicly acknowledging and celebrating such behaviour, students would feel motivated to behave in an environmentally responsible way.

CONCLUSION

In this study, researchers applied the Theory of Planned Behaviour (TPB) to investigate recycling practices among students at the University Malaysia Pahang Al-Sultan Abdullah (UMPSA). This research marks a pioneering effort in proposing and testing a structural equation model based on the partial least squares technique to predict the impact of attitude, subjective norm, moral norm, perceived behavioural control, and intention on the recycling behaviour of UMPSA students. Overall, all three objectives proposed in the study were achieved.

The findings for the first objective indicate that the level of recycling practised by UMPSA students is at a moderate level, with the majority of respondents only recycling used products 10 to 20 times since they started studying at UMPSA. These results were produced through descriptive analysis using IBM SPSS. For the second objective, this study aimed to assess factors influencing students' recycling intention and, consequently, recycling practice based on the TPB framework. A PLS-SEM analysis was conducted on the proposed hypotheses. As a result, out of the three factors in the TPB framework, only one factor, perceived behavioural control, influenced UMPSA students' recycling intention. Lastly, the results of the final objective revealed that moral norms also positively influence UMPSA students' recycling intention. The findings highlight the importance of focusing on students' ability to engage in recycling activities and their moral duty in promoting recycling practices within the UMPSA campus.

Findings from this study also add valuable empirical evidence to campus recycling literature by presenting insights from another local Malaysian university and expanding the application of TPB in Higher Education Institution (HEI) governance-related studies. Moreover, by understanding the factors influencing recycling behaviour, the university can devise effective interventions and policies to improve recycling frequencies and enhance the overall campus sustainability index at UMPSA. Such efforts not only contribute to a greener and more sustainable campus environment but also elevate UMPSA's status in the UI GreenMetric rank.

Nevertheless, this study is subject to a few limitations. Firstly, it only observes moral norms as an additional factor contributing to the formation of UMPSA students' recycling behaviour. Previous studies conducted in other local university settings have tested factors such as past behaviour (Sulaiman et al., 2019), information, situational factors, and personal norm (Jamil et al., 2021). Hence, it is recommended that future research observes other additional factors aside from moral norms that may further explain recycling behaviour among UMPSA students. By expanding the understanding

of the complexities surrounding students' recycling behaviour, UMPSA can continue to advance its campus sustainability efforts and produce environmentally responsible graduates.

Another limitation stems from the use of non-probability sampling (purposive) in this study to draw respondents from the target population, reducing the generalizability of the findings. However, this limitation is inevitable since the entire directory of currently active students at UMPSA, to be used as the sample frame, is confidential and has limited access. Nevertheless, the use of non-probability sampling still allows for testing the accuracy of proposed hypothesized effects (Hulland et al., 2018) and is deemed appropriate for producing valid and meaningful results (Din et al., 2023).

Finally, the present study recommends that future researchers investigate other campus sustainability campaigns organised by UMPSA management, such as the adoption of healthy lifestyles, waste repurposing efforts, and the use of carbon-free transportation within the campus. These studies would advance campus sustainability efforts and contribute valuable insights within the environmental-social-governance (ESG) body of knowledge, aligning with the world's recognition given to UMPSA (Abdul Wahit, 2023b).

CONFLICT OF INTEREST

The author(s), as noted, certify that they have NO affiliations with or involvement in any organisation or agency with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, jobs, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, expertise or beliefs) in the subject matter or materials addressed in this manuscript.

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