THE EFFECT OF ATTITUDE, PERCEIVED BEHAVIOURAL CONTROL AND SUBJECTIVE NORMS ON THE INTENTION TO REDUCE FOOD WASTE: MALAYSIAN PUBLIC UNIVERSITY STUDENT'S PERSPECTIVE

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Abstract

The purpose of this paper is to examine effect of attitude, perceived behavioural control and subjective norms on the intention to reduce food waste among students of Malaysian public universities, within the frame work of the Theory of Planned Behaviour. Moreover, three more variables which are environmental concern, peer influence, and self efficacy are included in the research to extend the proposed model. These variables are proposed to measure student's sustainability knowledge and their behavioural consequences. Thus, the current research, using a structured questionnaire, aims to identify the effect of attitude, perceived behavioural control and subjective norms on the intention to reduce food waste. The population of this study was are public universities student in Malaysia. According to Statista 2024, there are approximately 687,000 public university students in Malaysia and the unit of analysis was students above the age of 18 years, include Bumiputera, Chinese, Indians, non- Malaysians and others. Data were collected from 119 public university students through online survey and analyzed using and analyzed using PLS SEM software. Perceived behavioral control and subjective norms were significant predictors of students' intention to reduce food waste, while attitude alone did not predict intention. Self- efficacy strongly influenced perceived behavioral control, and peer influence significantly shaped subjective norms. Environmental concern positively influenced attitude but did not directly translate into intention without supportive social and control factors. Universities should focus on capacity building like food planning workshops and storage tutorials to enhance student's self efficacy and perceived control over waste reduction. Peer led sustainability campaigns and visible social norms like zero waste ambassadors can reinforce positive behaviors. Additionally, providing convenient infrastructure such as clearly labeled waste bins and composting stations will help translate intentions into action. This study the Theory of Planned Behavior by integrating environmental concern, peer influence, and self efficacy within a public university context, an area underrepresented in Malaysian research. It challenges the conventional assumption that attitude alone drives sustainable behavior, demonstrating the overriding importance of social and control factors. The findings inform targeted interventions for campus waste reduction and contribute novel insights into how psychosocial variables intersect in higher-education settings.

Key words: Food waste; Theory of Planned Behavior; Self-efficacy; Subjective Norms; Perceived Behavioral Control; Public University Students

1. Introduction

Food waste is a complex issue that occurs when perfectly edible food is thrown away unnecessarily. It arises from a combination of misuse and mismanagement across different stages of the food supply chain, from farm to fork (Costa et al., 2021). The alarming reality is that a staggering one third of all food produced globally ends up wasted, according to a 2018 report by the Food and Agriculture Organization of the United Nations (FAO). This colossal waste translates to a staggering financial loss exceeding USD 900 billion annually, impacting not just businesses and economies but also households directly. The consequences ripple through the food system, exacerbating food insecurity and increasing food market inflation, ultimately diminishing consumer purchasing power and leaving millions struggling to afford basic necessities. This grim picture underscores the urgency of addressing food waste, a critical issue that requires immediate and comprehensive solutions to ensure a more sustainable and equitable food system (FAO, 2018).

In public universities, the lack of such related amenities shifts greater responsibility on the students to accord their food waste a careful thought. Studying their goals to decrease food waste will also enable closing this gap based on non-structural approaches including educational crusades, peer pressure approaches, and themes of environmental conservation.

Therefore, through this research I intended to know whether the awareness and education skill on information on sustainability that is gain by the students has created intention to reduce food waste or not. Despite the fact that earlier academics have studied this subject extensively, just as cities or large organizations, student food waste is still proving to be an issue in universities today (Leal Filho et al., 2021) . Thus, the purpose of this study is to investigate the effect of attitude, perceived behavioural control, and subjective norms of public universities students in Malaysia on the intention to reduce food waste.

RQ1 : Does environmental concern influence student's attitudes toward intention to reduce food waste ?
RQ 2 : Does peer influence student's subjective norms toward intention to reduce food waste ?
RQ 3: Does self efficacy influence student's perceived behavioral toward intention to reduce food waste ?
RQ 4 : Does attitude, subjective norms and perceived behavioral control influence student's intention to reduce food waste ?

2. Theoretical Concept and Hypothesis Development

Food waste is still a contemporary problem of global proportions that entails negative environmental, social and economical impacts. The study "Antecedents of the Intention to Reduce Food Waste, Meta Analytic Review of Psychological, Social and Contextual Determinants of Behavioural Intentions Towards Reducing Food Waste" investigates main psychological, social, and contextual antecedents affecting consumer's decisions. The research adopts a meta-analytic approach whereby the results of a number of different studies are combined to create a coherent theoretical framework for the predictors of food waste reduction behaviours. Hence, it examines constructs grounded on behavioral theories such as the Theory of Planned Behavioral (TPB), the use of demographic and cultural variables as moderators. Besides that, the research work, Intensifying the Extended Theory of Planned Behavior Model and Food- Related Routine to Predict Food Waste Behavior, makes use of the ETPB to formulate a systematized model for ascertaining the determinates of food waste behaviour. It

includes timetables to food intake and takes into account the effects of numerous psycho-emotional and stereo-typal factors. The research also uses attitudes, subjective norms, perceived behavioral control as independent variable, food waste behaviour as dependent variable, anticipated guilt as mediator and socio demographic factors such age, education level a moderator. Hence in this study, TBP will be used to investigate the effect of attitude, perceived behavioural control, and subjective norms of public universities students in Malaysia on the intention to reduce food waste.

It is expressed that the food waste behavior is habitual. Williams and Brown (2021) revealed that main food waste behaviours are, for instance, buying more groceries than necessary, cooking more than necessary, and not storing or repurposing leftovers. Most of these routines arise from tradition, flexibility, or miscalculated demand for consumption. Instead, Williams and Brown revealed that undermining habitual behaviors with behavioral prompts, for example, a wardrobe list or portion size assistance, can lead to more conscious patterns of usage and disposal.

2.1 Previous Studies on Intention To Reduce Food Waste

This study has examined the current public university in Malaysia. Further proceeds to latent variables, its required to check on the past studies context on the analysis has been researched in intention to reduce food waste. It has been captured in summarized there is a lack of research on the effect of attitude, perceived behavioural control, and subjective norms of public universities students in Malaysia on the intention to reduce food waste.

2.2 Research Gap

Based on the reviewed literature, several critical gaps have been identified. Although the Theory of Planned Behavior (TPB) has been widely applied in food waste studies, prior research shows that food waste continues to be a significant issue among university students, indicating that traditional TPB variables may not fully capture the complexity of their behavior (Ajzen, 1991; Kantor et al., 2019). Additionally, factors such as environmental concern, peer influence, and self-efficacy have been suggested as potential contributors to behavioral intentions but are often underexplored in university contexts (Bamberg & Möser, 2007; Cialdini & Goldstein, 2004; Schwarzer & Fuchs, 1996).

This study addresses these gaps by focusing specifically on public university students in Malaysia and investigating the effect of attitude, perceived behavioral control, and subjective norms, the core components of TPB on their intention to reduce food waste. By doing so, it revalidates TPB within a Malaysian context, contributes localized insights to global sustainability efforts, and sheds light on how these psychological factors influence students pro-environmental actions. Furthermore, this study helps educational institutions and policymakers design more targeted interventions based on actual student behavior and social norms. Thus, it fills a significant void in the literature by bridging theoretical understanding with practical, region-specific behavioral analysis

2.3 Research Framework and Hypotheses Development

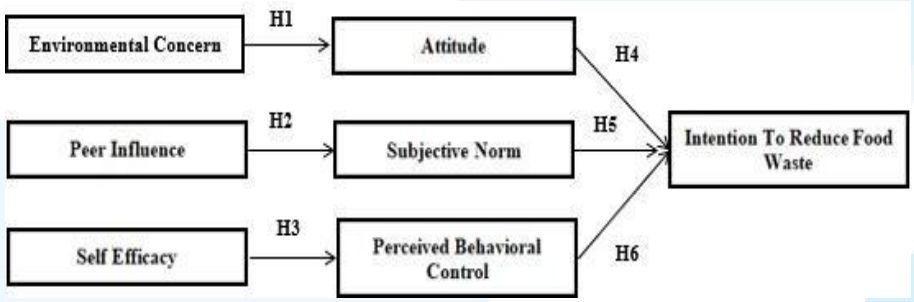

Figure 1 Research framework

3. Research Methodology

3.1 Measurement of Constructs

This study was conducted utilizing a structured questionnaire and a quantitative survey. There are nine sections in a survey questionnaire. Section A with screening questions, Section B with respondent demographic profile, and Section C with measurements items which adapted from earlier researchers to ensure topic validity and scored using Five-Likert ratings ranging from 1 to 5, with 1 equaling "strongly disagree" and 5 equaling "strongly agree".

3.2 Data Collection and Samples

This study is quantitative research. Thus, researchers used probability sampling which is cluster sampling in this study. The researchers used cluster sampling because they sorted the population into several groups called cluster which are public university students in Malaysia include Bumiputera, Chinese, Indians, non-Malaysians and others with the age of group being from 18 years old and above.

Therefore simple random sample of the cluster is selected from the population which was separated into Bumiputera, Chinese, Indians, non-Malaysians and others who are public university students in Malaysia. This technique has been implemented to ensure that the representation of the variables for the study is unbiased. This technique will execute by spreading questionnaires directly to the public university students in Malaysia. They take few minutes to answer the question given.

In this research, data is collected from selected food consumers through a questionnaire survey. The questionnaire is designed based on a thorough review of existing literature on the effect of attitude, perceived behavioural control, and subjective norms on the intention to reduce food waste. It begins Section A with pre-screening questions to validates the profiles of respondents to ensure they match the demographic criteria such as students from public university in Malaysia. Section B collects general personal information and demographic data of the respondents, including gender, age, income, education level, and the enrolled public university's name. Section C investigates public university student's environmental concern, peer, self efficacy, attitude, perceived behavioural control and subjective norm toward intention to reduce food waste. The questionnaire is accompanied by a cover letter explaining the purpose of the study and ensuring respondent confidentiality to encourage participation.

G* Power version 3.1.9.4 software was used to assess the power of the 119 samples generated from number of predictors 3. Using G*Power with a statistical significance (level) of 0.05 yielded a power of 0.95 (almost 1), which was significantly higher than the general guideline for quantitative research for testing the hypotheses (Faul et al. 2009). Finally, a link

of online survey was distributed to 119 respondents with follow-up messages and emails at 11 weeks intervals. A total of 119 responses were obtained. Thus, a total of 119 responses deemed valid and usable for analysis represents 100 per cent response rate. Therefore, responses that was gathered fulfilled the required sample size, hence its power also fulfilled 0.95.

4. Analysis

Partial least square (PLS) technique of structural equation modelling is used to perform the analysis due to the exploratory nature of the study, high complexity, and relatively low sample size of the model (Joe F. Hair, Ringle, & Sarstedt, 2011). The data analysis follows the two-step analysis approach that has been recommended by researcher Joe F. Hair et al., (2011). The first step involves analyzing measures of reliability and validity of the measurement model while the second step involves assessment of the structural model itself.

4.1 Descriptive Analysis

Descriptive analysis shows that the majority of respondents were female with a frequency of 84 (70.6%), while males accounted for 35 (29.4%). In terms of age, most respondents were in the 21–30 age group, comprising 76 individuals (63.9%), followed by those aged 31–40 at 39 (32.8%), and a smaller group aged 41–50 at 4 (3.4%). No respondents were from the 18–20 age group. Regarding education level, 46 respondents (38.7%) held a bachelor's degree, 66 respondent (55.5%) held a master's degree, and 7 respondent (5.9%) had a PhD. No respondents selected Diploma and Others for their education level. Monthly income distribution showed that the largest group earned RM3501 - RM5000 with 36 respondents (30.3%), followed by below RM2599 with 28 respondent (23.5%). RM2600–RM3500 with 23 respondent (19.3%),

RM5001–RM7500 with 22 respondent (18.5%) and over RM7501 with 10 respondent (8.4%). University wise, most respondents were from USM with 86 respondent (72.24%) followed by UM with 11 respondent (9.2%), UKM with 10 respondent (8.4%), UMK with 5 respondent (4.24%), UPM with 4 respondent (3.4%). Other universities had minimal representation, including UMP, UMS and UTHM with only 1 respondent each (0.84%).

4.2 Results

4.2.1 Assessment of Measurement Models

The analysis of the results of constructs validity and reliability are given below. The factors loading, average variance extracted, and composite reliability have satisfactory results which align with the statistical requirements (Hair et al., 2019). The results confirm that all of the constructs have convergent validity.

4.2.2 Heterotrait-monotrait Ratio (HTMT 0.85)

The results of Heterotrait monotrait (HTMT) were presented in Table 5. The HTMT values were less than 0.85 which indicated the satisfactory level of discriminant validity (Kline, 2011; Henseler, Ringle, & Sarstedt, 2014)

4.2.3 Assessment of Structural Model

To make sure the measurement model evaluation is done correctly and successfully, an evaluation of the structural model that is based on the results of the PLS-SEM must be done as well. It's important to measure and evaluate things like the coefficient of determination (R2) and the cross-validated redundancy measure when making this kind of determination (Q2). Before looking at the results of the structural model evaluation, it is important to look at the collinearity that is subject to testing the use of the variance inflation factor (VIF). The goal is to make sure there is no bias in the regression results. If the VIF value is less than 5, Hair et al. (2019) say this is ideal. In the table below, you can see the VIF values. All of them are less

than 5, which means that the collinearity between the constructs was not a problem, and you can go on with the study. The next step is to use the blindfolding method to figure out how predictive (Q2) the blindfolding method is. The predictive relevance value must be greater than zero in order to show both the path model's predictive accuracy and how important it is to people who use it (Hair et al., 2019). A value greater than 0 indicates small predictive accuracy, a value greater than 0.25 indicates medium accuracy, and a value greater than 0.5 indicates a high level of predictive accuracy for Q2. The statistics below show that operational performance and supply chain resilience are good predictors of how well things will go.

4.2.4 Hypotheses Testing Results

There will now be an evaluation to analyze the significance and relevance of the structural model relationships. The objective is to determine whether the proposed theoretical hypotheses are empirically supported, following the guidelines of Hair et al. (2011). In this analysis, the path coefficient, along with t-values and p-values, is used to assess the significance levels of each relationship.

The results of the path coefficients presented in the table indicate that there is a significant relationship between Environmental Concern (EC) and Attitude (A) ($\beta = 0.631$, $t = 10.271$, $p < 0.05$), suggesting that environmental concern has a positive influence on student's attitude toward food waste reduction. Similarly, Perceived Behavioral Control (PBC) shows a significant effect on Intention to Reduce Food Waste (ITRFW) ($\beta = 0.559$, $t = 4.313$, $p < 0.05$), and Subjective Norm (SN) also significantly predicts ITRFW ($\beta = 0.302$, $t = 2.611$, $p < 0.05$), indicating that both perceived control and subjective norm contribute to the intention to reduce food waste.

Furthermore, Peer Influence (PI) significantly influences Subjective Norm ($\beta = 0.494$, $t = 6.692$, $p < 0.05$), while Self-Efficacy (SE) shows a strong and significant effect on Perceived Behavioral Control (PBC) ($\beta = 0.687$, $t = 12.764$, $p < 0.05$), supporting the theoretical foundation of the model.

However, the relationship between Attitude (A) and Intention to Reduce Food Waste (ITRFW) is not statistically significant ($\beta = -0.033$, $t = 0.330$, $p > 0.05$), suggesting that in this context, attitude alone does not predict the intention to reduce food waste among public university students in Malaysia.

In conclusion, hypotheses H2 to H6 are supported by the data, while H1 is not supported, indicating that while most constructs in the model significantly influence food waste reduction intention, attitude does not play a statistically significant role in this particular study.

Table 1 Hypotheses Testing Results

Hypothesis	Relationship	Path Coefficient (β)	*t* Value	*p* Value	Decision
H1	A → ITRFW	-0.033	0.330	0.371	Not Supported
H2	EC → A	0.631	10.271	< .001	Supported
H3	PBC → ITRFW	0.559	4.313	< .001	Supported
H4	PI → SN	0.494	6.692	< .001	Supported
H5	SE → PBC	0.687	12.764	< .001	Supported
H6	SN → ITRFW	0.302	2.611	0.005	Supported

5. Discussion

This study provides a deeper understanding of the psychological and social drivers influencing university student's intention to reduce food waste within the framework of the

Theory of Planned Behavior (TPB). The significant role of perceived behavioral control and subjective norms aligns well with TPB's core proposition that behavioral intention is shaped not only by one's evaluations but also by social expectations and the perceived ease or difficulty of performing the behavior (Ajzen, 1991). In contrast, the unexpected insignificance of attitude in predicting intention suggests that mere cognitive awareness or emotional evaluations of food waste may not translate into behavior, particularly in institutional settings where contextual and structural constraints are prevalent.

The findings underscore the contextual limitations of TPB, where habitual behaviors and environmental constraints such as cafeteria practices, portion sizes, and limited storage facilities may override personal attitudes. This reinforces the argument made by Graham-Rowe et al. (2015), who emphasized the gap between favorable attitudes and actual behavioral execution, often driven by situational cues and ingrained habits.

The integration of self efficacy into the model further strengthens the theoretical framework by acknowledging the role of individual confidence in controlling outcomes. This aligns with Bandura's (1997) concept of self-efficacy, where individuals are more likely to engage in goal oriented behaviors when they believe in their capacity to do so. Similarly, the role of peer influence in shaping subjective norms reflects the importance of interpersonal relationships and social learning, consistent with the work of Cialdini and Goldstein (2004), who argue that behavior is often molded by the expectations of close social groups.

The relationship between environmental concern and attitude confirms the hypothesis that individuals with a greater awareness of ecological impacts are more inclined to form negative attitudes toward food waste. However, this concern does not appear sufficient on its own to prompt behavioral change unless accompanied by enabling factors such as social support and perceived control.

6. Conclusion

This study investigated the influence of attitude, subjective norms, and perceived behavioral control on the intention to reduce food waste among Malaysian public university students, while also integrating environmental concern, peer influence, and self efficacy into Theory of Planned Behavior (TPB) model. The findings confirmed that perceived behavioral control and subjective norms significantly affect student's intention to reduce food waste, while attitude, contrary to theoretical expectations, did not exhibit a statistically significant impact. This highlights the complexity of food waste behaviors in university environments, where structural, social, and psychological factors interact.

Ultimately, this study contributes to both academic and institutional efforts to promote responsible consumption and supports the advancement of global sustainability goals, particularly SDG 12: Responsible Consumption and Production. Future research can expand this model by examining other demographic groups or including habitual and emotional determinants of food waste to offer a more comprehensive understanding of sustainable food behaviors.

6.1 Limitation of the study

While this study offers valuable insights into the behavioral and social factors influencing food waste reduction intentions among Malaysian public university students, several limitations should be acknowledged. The study's sample was limited to students from public universities in Malaysia, which restricts the generalizability of findings to other educational or cultural contexts, such as private institutions or universities in other countries. The sampling method, while statistically sufficient, may not fully capture the diversity of

experiences, behaviors, or attitudes present across the broader student population. Additionally, although the extended Theory of Planned Behavior model used in this study incorporated environmental concern, peer influence, and self-efficacy, it did not include other potentially influential variables such as habit, emotional drivers like guilt or regret, institutional infrastructure, or availability of waste management facilities. These factors could provide deeper insight into the habitual and contextual nature of food waste behaviors.

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