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Exploring The Dimensionality for Sustainable Food Waste Management Framework: A Pilot Study Approach

[1,2*]Nik Rozana Nik Masdek, [1]Kelly Wong Kai Seng, [1]Nolila Mohd Nawi, [1]Juwaidah Sharifuddin, and [3]Wong Wang Li

[1]Department of Agribusiness and Bioresource Economics, Faculty of Agriculture, Universiti Putra Malaysia
[2]Socioeconomic, Market Intelligence, and Agribusiness Research Centre, Malaysian Agricultural Research and Development Institute
[3]School of Economics and Management, Xiamen University Malaysia

*Corresponding Author Email: nrozana.me@gmail.com

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ABSTRACT
Sustainable food waste management practices at the source are directly dependent on household behavior. A valid and reliable instrument is needed to evaluate the sustainable food waste management (SFWM) research framework. Thus, the purpose of this paper is to propose a new SFWM framework on a pilot scale before starting the main research. A pilot study was conducted to evaluate the survey questionnaire's usability and reliability. Respondents from 150 urban households in Klang Valley was surveyed using an online survey method. A detailed validation of the study constructs was done through the Exploratory Factor Analysis (EFA), producing a usable final factor structure. The results confirmed the constructs have good reliability based on the Cronbach's alpha values that ranges from 0.860 to 0.979. The results provide useful information on factors that could affect the behavioral intention of practicing SFWM in people's daily life and may be adopted by future research on a larger scale. The article contributes to the body of research in this research context by describing the pilot test method and process. A proposed framework that integrates additional variables into a TPB-based theory was used for examining SFWM behavior outcome in a more comprehensive model. Other studies in the field were mostly conducted on food waste reduction behavior, but this study intends to close the gap of households' intention to manage them sustainably. Besides providing a new framework for SFWM, the need for a pilot study is highlighted to achieve an improved research design, adding to the lack of literature on pilot studies in the sustainable food waste management context.

Keywords: Behavior, Factor analysis, Household, Intention, Pilot test.

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1. INTRODUCTION

Food waste is recognized by the Food and Agricultural Organization to be a major global issue, with one third of all food that is produced for human consumption being wasted. Food waste and losses at the retail and consumer levels in the United States were estimated to be 188 kg per capita per year, with a total value of $165.6 billion (Buzby & Hyman, 2012; Davenport et al., 2019). Food waste in Europe and the North America is estimated to be between 280 kg to 300 kg per capita per year (Garrone et al., 2014; Ghafar, 2017). Food waste in Asian countries is expected to rise over the next 25 years due to economic and population growth (Chen et al., 2017). There is little to gain from business as usual, for over the next 30 years, global waste generation is expected to increase to 3.4 billion tonnes, up from 2.01 billion tons in 2016 (World Bank, 2018).

The scenario in Malaysia is equally serious. According to SWCorp (Solid Waste and Public Cleansing Management Corporation), Malaysia recorded 38,000 tons of daily domestic waste being produced, of which 17,000 tons or 45% of them is food waste, claiming the biggest portion. Out of that portion, 4,080 tons or 24% is actually avoidable. Households actually contribute the most food waste that occurs throughout the entire food system. A study was conducted by the Malaysian Ministry of Food and Industries, MAFI (2021) to estimate its monthly food waste by user category by comparing between households, small and medium enterprises (SMEs), and hospitality services sector. It was found that households produce the highest amount of food waste (51.82%), and that the food waste issue is more prevalent in densely populated cities. In terms of economic impact, it is worth RM2,700 of food waste per annum among urban residents (Sundaram et al., 2019). In a social context, the increasing amount of food waste is unjustified in the midst of poverty and food insecurity happening around the world.

Food waste is also an environmental concern, due to the fact that the majority of food waste ends up in landfills. Despite landfilling and incineration that have been adopted to cope with food waste, the practice could not eliminate the release of methane from the food waste decaying in landfills, causing pollution to the environment. Besides that, there is also the problem of existing landfills in Malaysia already reaching their maximum capacity. For example, the landfill in Sungai Udang located in Melaka is expected to reach its maximum capacity

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by 2023 (The Star, 2019). Landfilling is the least preferred option (EPA, 2020) due to its many negative consequences. Therefore, alternative sustainable approaches should be reviewed and implemented as outlined in Sustainable Development Goal 12, which encourages responsible consumption through recycling and recovery. In tandem, recent local news highlighted that people are looking for solutions to handle their food waste as more people are preparing their food at home (The Star, 2021).

2. LITERATURE REVIEW

Landfilling is at present the most common waste disposal practice in the country. Scholarly articles specifically on food waste management and disposal in Malaysia is limited since most published papers would classify food waste as municipal solid waste (Ng et al., 2021). In contrast to many other affluent nations, all waste generated in Malaysia are disposed of in landfills without any pre-treatment, regardless coming from residential areas, institutional organizations, commercial and industrial sectors (Ismail & Manaf, 2013; Tang, 2019). If no action is taken on managing the food waste issue in a more sustainable way, existing landfills in the country will bear the pressure and reach their authorized capacity. More than 80 percent of the Malaysian open dumping landfill sites will shut down within 10 years due to full capacity (Yong et al., 2019).

Reducing the food waste that goes to the landfills could overcome the issues of pollution and climate change. The action taken at the final stages of the food supply chain is critical for limiting negative consequences, given that the high volume of food waste occurs at the household level. A lot of issues that pose a threat to sustainability are ingrained in human behavior and thus can be managed by modifying their existing conduct or behavior in order to reduce its impacts, such as altering behavioral patterns or adopting best household practices. Reusing food leftovers, separation of food and non-food waste, as well as composting are considered environmentally friendly behavior that households should be responsible of doing. However, in terms of the current practices, Moh & Abd Manaf (2014) observed the rate of food waste reused and recycled in Malaysia is relatively low, being at only 5 percent in comparison to papers (60%) and plastics (15%). The awareness on composting among Malaysians is also relatively poor (Hashim et al., 2021). The usual practice of landfilling and incineration for food waste disposal had been the norm and widely accepted due to the method being the simpler way and more cost-effective for the households (Zainal & Hassan, 2019). In fact, composting and energy recovery is not a common practice (Aja & Al-Kayiem, 2014), in line with the record of only 4 percent of waste being recycled or composted especially in lower income countries (World Bank, 2018).

To avoid ending up in landfills, a country's resources should ideally be consumed and then repurposed indefinitely. Few studies have focused on sustainable food waste management at the household level. A number of evidence have shown several determinants that could influence the behavioral intention of Malaysians to practice sustainable food waste management (SFWM) at source, such as attitude, subjective norms, and perceived behavioral control (Ayob et al., 2017; Karim Ghani et al., 2013). However, there has been no continuation of the research in terms of other potential antecedents affecting urban resident's intention to practice and how it relates to the achievement of the actual behavior. Research on this matter will provide guidance and understanding of how the internal and external factors can be managed to contribute to the increase of SFWM among households in Malaysia.

Therefore, the objective of this research is to identify the antecedents of the households' behavioral intention to practice sustainable food waste management from the source. It is a key principle in behavioral theories that intention strongly influences behavioral performance. In other words, if one has the intention to act in favor of reducing food waste that goes to the landfills, one would strongly behave positively towards practicing SFWM. For this matter, information shall need to be collected from members of the households. Prior to actual data collection, the study conducted a pilot study phase following the methodology that will be deliberated in the next section.

Factors determining sustainable food waste management

The Theory of Planned Behavior (TPB) have theorized that attitude, subjective norms and perceived behavioral control explain intention; however, additional factors can and should be examined since they can help improve understanding of people's conduct (Ajzen, 2011). It was recommended to combine intrinsic and extrinsic factors to ensure effectiveness in improving participation (Sunarti et al., 2021) in a certain behavior. There have been a synthesis of research results identifying intrinsic factors driving household waste sorting and recycling, namely moral norms, which refers to the feeling of individual moral obligation based on personal values (Matthies et al., 2012; Saphores et al., 2012). Besides that, environmental concern was also demonstrated to play a positive role towards green behavior (Felix et al., 2018; Lee et al., 2014; Li et al., 2020; Polonsky et al., 2014). Henceforth, these two factors are referred to as personal moral norm and environmental concern to be integrated into a TPB-based model.

On the extrinsic factors, Ma et al. (2018) found that situational factors is a significant determinant of their respondents' behavioral intention. When situational factors were combined with financial incentives and supporting facilities, they improved waste management participation of residents especially in Thailand (Wichai-utcha & Chavalparit, 2019). Because situational factors may inhibit participation of urban residents to actually practice SFWM, it is postulated that policy effectiveness will play a role as to whether individuals shall be motivated or not to act on the intended behavior. Wan & Shen (2013) suggested if a government's action is perceived as effective, a higher level of intention would be induced to perform that particular behavior. Despite evidence that the above-mentioned factors influence consumer or household behavior, there is limited evidence on its integration into a TPB-based model. To complement this literature, this study proposes situational factors and perceived policy effectiveness to be included in the research framework.

An extended TPB-based model is proposed in this study to test the relationships among attitude, subjective norms,

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perceived behavioral control, personal moral norm, environmental concern, situational factors, perceived policy effectiveness, and intention to practice SFWM. It is also important to note that although there are evidence of the effectiveness of using TPB to analyze individual intentions and behavior, it has also been demonstrated that people from different background and culture may be motivated differently (Ames & Cook, 2020). As a result, it is crucial for scholars and stakeholders to assess if prior TPB findings are transferrable to other national or cultural settings with comparable validity. Food consumption and wastage management behavior varies across cultures, which justifies investigation in various countries and locations (Mattar et al., 2018).

In contrast to other published studies in the context of SFWM, this study focuses on a sample of Malaysian residents in the urban areas, which adds another unique contribution to the literature. To date, information on the attitude and behavior of households in developing countries regarding food waste is scarce (Mattar et al., 2018). Prior research was mostly carried out in countries like Canada (Parizeau et al., 2015), Denmark (Stancu et al., 2016), Greece (Abeliotis et al., 2014), Italy (Principato et al., 2015; Setti et al., 2016), Romania (Stefan et al., 2013), the United States (Neff et al., 2015; Qi & Roe, 2016) and New Zealand (Tucker & Farrelly, 2016). It was noted that these are all western countries where the consumers' culture and practices may differ with their Asian counterpart.

Purpose and importance of the pilot study

Once decisions have been made on the study objectives, the subjects or respondents of the study, the variables and constructs involved, and the data collection method, the research execution phase can be carried out, which includes pilot testing of the measurement instrument. The pilot study is a small-scale study that is carried out before conducting the main research which is closely tied to the bigger-scale research (Eldridge et al., 2016). A pilot study is usually a small subset of the target population to ensure that the data collection instrument utilized in the study is reliable and actually measures what they are supposed to measure. Testing the questionnaire, as well as the feasibility of techniques and methods are the main objective of this pilot study. It provides assurance that the actual study will succeed by identifying any design flaws, discover any burden faced by participants, and help refine data collection and analysis plans in advance (Beebe, 2007).

According to Adams et al. (2007), a pilot study should test the following: (a) wording of the questions, (b) sequence and layout of the questionnaire, (c) fieldwork arrangements, (d) analysis procedures, (e) training of enumerators, if any, (f) estimating response rate, and (g) determining completion time. There is substantial support for conducting a pilot research to identify possible risks relating to the size of the sample, its selection process, the technique of data collection, the management or coding of data and its analytical procedure (Moore et al., 2011). Furthermore, the majority of the published pilot studies originated from the medical literature (Lancaster, 2015) and appears to be absent in other fields (van Teijlingen & Hundley, 2002). More information on the conduct of pilot studies needs to be published and disseminated to contribute to knowledge and future practice (Eldridge et al., 2016).

Taking into consideration the above discussion, the following are the objectives of conducting this pilot study:

i) To produce a questionnaire to measure the components of the study: intrinsic and extrinsic factors influencing SFWM, and the intention to practice SFWM.
ii) To analyze the reliability of the data collection instrument as well as its validity.
iii) To verify whether the designed questionnaire addresses the objectives of the main study.

3. METHODOLOGY

Framework development

Based on the discussion in the preceding section, Figure 1 depicts a framework developed using the Theory of Planned Behavior (TPB) developed by Ajzen (1985) as the underlying theory, with the aim of predicting and explaining individual behavior in various situations, by postulating a set of relationship between attitude, subjective norms, perceived behavioral control, and behavioral intention. Note that the research framework for the current study is an integration of the TPB model together with other intrinsic and extrinsic factors to provide a more comprehensive model in examining SFWM behavior. The framework consists of 7 independent variables (attitude, subjective norms, perceived behavioral control, personal moral norms, environmental concern, situational factor, perceived policy effectiveness) that may have an impact on SFWM behavioral intention. Therefore, there are a total of 8 constructs requiring measurement items to conceptualize them in the proposed framework below (Figure 1).

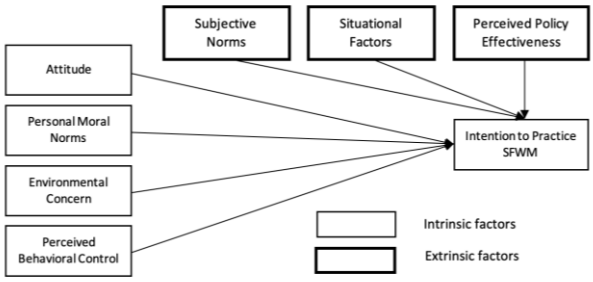

Figure 1: Conceptual Framework

Data collection process

This study obviously requires the collection of primary data. The survey method using questionnaires was chosen to best meet the research objective, to facilitate the research questions and prove the research hypotheses. Prior to the pilot study, a pre-test was conducted to ensure validity of the data collection instrument. A pre-test is carried out to determine the content validity, face validity, and criterion validity, by obtaining expert validation (Bahkia et al., 2019; Rahlin et al., 2019). The major goal of pre-testing the questionnaire is for participants to understand all of the questions. Furthermore, pre-testing will assist researchers in identifying any flaws in the questionnaire before distributing

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the final version to the target sample in the population, hence avoiding biases (Sekaran & Bougie, 2016).

Six individuals were recruited during the pre-test stage, two of whom are subject matter experts while another four were academic members whom are experts in conducting surveys and data analysis. The panel of experts reviewed the face validity and content validity of the instrument. The subject matter experts were also stakeholders in Malaysia's solid waste handling and food waste management. At the time of review, the academicians were employed at local universities. They were tasked with determining the suitability of individual items and the instrument as a whole through e-mail. A virtual discussion session via *Google Meet* was also held to ease direct feedback for improvements pertaining to the content of each component and items in the data collection instrument. Modifications were made in response to their feedback. The procedure resulted in several changes in the questionnaire with some items being removed during the pre-test stage. Double-barrelled questions that will cause confusion were carefully avoided or eliminated during the pre-test stage. Besides that, ambiguous questions where the respondents seemed unsure of the meaning which may lead to incorrect assumptions, were dropped during this stage. The amount of time it took to complete the questionnaire was recorded. Selected members of household units in the urban area answered the questionnaire during the pre-test since they represent the actual group of future respondents. Revisions were made to the items based on the pre-test results to ensure improved face validity and content validity.

The pilot study mostly employ closed-ended questions either a nominal scale, ordinal scale, Likert or ratio scale. In other words, respondents were given choices from a set of pre-determined possibilities offered by the researcher. In the case where the given choices may not be exhaustive, a blank space is provided for the respondents to fill in other answers. Closed ended questions provide several alternatives to ease decision making for the respondents during the answering process. They also provide convenience to researchers during the coding process subsequent analysis. The questionnaire form is divided into four sections. Section A contains questions related to households' food-related and waste management practices, using a multiple choice structure format. Section B and C includes several subsections of the intrinsic and extrinsic factors, with a series of item statements assessing each construct. The item statements for each construct were adapted from previous studies. The last section covers the respondent's demographic information, providing multiple choice and simple open-ended questions.

A seven-point Likert scale was used to measure the items in section B and C, where respondents were requested to pick a scale that most represent their extent of agreeableness to the given statements (1 = strongly disagree to 7 = strongly agree). Sekaran and Bougie (2016) strongly proposed that the wordings and language used in the questionnaire be suited to the respondents' level of comprehension while constructing the questionnaire for the pilot project. The unit of analysis for this study is the individual level, namely the household member. The questionnaire was initially drafted in English. Taking into consideration that 60% of the Malaysian population are Malays, and that the official national language is Bahasa Melayu, the questionnaire was also translated into the national language. Respondents were given the freedom to choose which language they prefer or understand more.

Generalizability is very important for the actual data collection thus the sampling procedure intends to employ multistage cluster sampling procedure. The first cluster identified is the central region. The sample consists of household representatives from clusters or locations within the Klang Valley. The pilot research on the other hand, used convenience sampling to choose respondents. The convenience sampling approach was the method of choice because the goal is for instrument testing or measurement validation, rather than obtaining generalizable inferences (Bhattacherjee, 2012). The samples for the pilot study were randomly selected from two different municipalities in Malaysia. The respondents were members representing their household unit. The following criteria is used to filter the respondents: (1) they must be a resident within the Klang Valley municipality, and (2) they must reside in urban areas.

Due to the Covid-19 pandemic and the fact that the Klang Valley area at the time of pilot data collection was under the Malaysian Government Movement Control Order, the questionnaire survey was distributed via online over a period of three weeks, from 28th July 2021 to 18th August 2021. First, a cover note was attached with an online link (Google Forms) and shared via *Whatsapp* groups in the respective residential areas. Officers representing both Kajang Municipal Council and Shah Alam City Council, provided the necessary assistance to circulate the survey link in their residential's communication platform. Survey link through emails was given based on requests. The cover note which was attached together with the online survey contains information on the study objectives, respondents' eligibility to participate, confidentiality assurance on their responses, and instructions on how to answer the questions.

After the first round of distribution, a reminder was given out to the residents after five days through a private message to the representative of the residential area. Later, the same online link was sent again during the final week of pilot test data collection. Participants were informed in advance that their participation is voluntary. They were also notified on the time taken to complete the questionnaire, fifteen minutes approximately. When participants click on the survey link, they were prompted to answer filter questions on whether they reside in urban areas within the Klang Valley. The process of distributing the questionnaire was tested to ensure smooth administration of e-mails and *Whatsapp* messages, that the online survey link is accessible and able to be completed successfully. The online survey managed to yield 155 responses. However, five participants did not fulfill the preliminary requirements and thus their questionnaires were discarded. Finally, 150 responses from the pilot study were used for further analysis.

Data analysis

The dimensionality of items may change from the original adaptation of questionnaire instrument. These may be due to different factors like the different field of study, the culture of

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the population, or the socio-economic background of the targeted sample. The time duration between the current study and the previous studies are also a contributing factor. Due to the differences mentioned, the results obtained by other studies may not apply (Awang, 2012).

Exploratory factor analysis (EFA) is a data reduction method intended to check the factor structure of the study constructs. EFA allows to consider the factors underlying the data as having the same importance, because it examines the possibility of a reduced number of latent variables accounting for multiple individual variables (Schreiber, 2020). EFA was used to evaluate the inter-correlations between items to identify groups of variables that strongly correlated around an underlying construct, otherwise known as a factor. In other words, the goal with EFA is to reproduce the correlation matrix with a few factors. Initially, the factorability of the items was examined. For sampling adequacy, this study relies on the Keiser-Meyer-Olkin (KMO) measure. The range for KMO is from 0 to 1, where 0 indicates a disperse correlation matrix while values near one indicate a closer pattern of correlations (Kaiser, 1974).

Extraction technique via Principal Component Analysis (PCA) was used to obtain the eigenvalues to maximize the variance of the first components. Each component after that explain progressively smaller portions of the variance, all of which are uncorrelated with each other. The current study employed the varimax rotation, also known as the orthogonal rotation. Afterwards, decision on the number of factors to retain is based on two criteria; the Kaiser rule where all eigenvalues over 1 are considered a factor, and by scrutinizing the scree plot to see the intersections of lines (Cattell, 1966). When using PCA, item with cross-loading greater than 0.50 were not accepted. DeVellis (2006) suggested a factor loading cut-off score of 0.40 to be used for item retention. Finally, there must be at least three items to represent a factor for it to be retained (Hair et al., 2019).

4. RESULTS AND DISCUSSION

Background of respondents

The 150 data were analysed using the Statistical Package for the Social Sciences software (SPSS). Descriptive statistics was used to calculate respondents' information. The output from frequency analysis helps in drawing conclusions to the demographic background of the respondents. As expected, there were more female respondents (62.7 %) compared to male (37.3%). Most of them are in the age group of 40-49 years (40.3%) followed by senior citizens of 50 years and above (23.5%), 30-39 years (21.5%) and those of 29 years and below (14.7%). The majority of the respondents holds a Bachelor's degree (63.3%). Few earned masters and doctoral degree (11.3%). In terms of their occupation, 44.0% of the respondents works for the government while 22.7% works in the private sector. This is followed by housewives (12.7%), self-employed (9.3%), unemployed (7.3%) and retirees (4.0%). More than half of the respondents are in the lower-income group also known as the B40 category where their household income is below RM4,850 per month. Households under the M40 or middle-income category (31.9%) earns between RM4,851 and RM10,970, while those under the T20 upper-class household income group exceeds RM10,970 per month (15.4%). The urban residents staying in landed house-type refers to bungalows, terrace, semi-detached and village houses which contributes to 59.3% of the study sample. Conversely, 40.7% lives in high-rise buildings like flats, apartments and condominiums. The overall profile from the pilot study displayed in Table 1 was able to provide a fairly good description and overview of the Malaysian urban household's structure.

Table 1: Demographic Profile of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	56	37.3
	Female	94	62.7
Age	29 years and below	22	14.7
	30-39 years	32	21.5
	40-49 years	60	40.3
	50 and above	35	23.5
Education level	Secondary	38	25.3
	Undergraduate	95	63.3
	Postgraduate	17	11.3
Occupation	Government sector	66	44.0
	Private sector	34	22.7
	Self-employed	14	9.3
	Housewife	19	12.7
	Retired	6	4.0
	Unemployed	11	7.3
Household income category	B40	79	52.7
	M40	48	31.9
	T20	23	15.4
House type	Landed	89	59.3
	High-rise	61	40.7

The online survey using Google Forms platform was regarded as suitable and appropriate for collecting data from urban households in Malaysia. The response rate increased after reminders were sent out which indicates the importance of following the same procedure when conducting the actual data collection later. Besides that, the process of answering the online survey took approximately fifteen to twenty minutes. Thus, it is concluded that time taken to complete answering the survey would be sufficient to gauge responses from respondents. It should also be noted that the benefits of using online survey was the avoidance of unanswered questions because the system allows for the researcher to set selected questions as compulsory. Therefore, participants were not allowed to move to another section if they missed a question. Applying that feature may avoid unnecessary missing data in the main study conducted later, although it should be used with caution where several questions (eg. age or income) should be left open to the choice of the respondents to answer or not.

Exploratory factor analysis results

The Exploratory Factor Analysis (EFA) procedure using PCA with Varimax rotation was carried out on the items. It was observed that the correlation matrix revealed the presence of many coefficients of 0.3 and above, indicating reasonable factorability. The Kaiser–Meyer–Olkin measure of 0.902 verified the sampling adequacy, which was above the

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commonly recommended value of 0.60, and Bartlett's Test of Sphericity was significant at <0.05. The communalities were all above 0.3, further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was deemed to be suitable with all 47 items.

Table 2: Total Variance Explained

Factor No	Eigenvalue	Cumulative Eigenvalue	Variance Explained (%)	Cumulative Variance Explained (%)
1	19.012	19.01	40.452	40.452
2	6.965	25.98	14.820	55.272
3	4.251	30.23	9.044	64.316
4	2.067	32.30	4.398	68.714
5	1.718	34.01	3.655	72.369
6	1.650	35.66	3.511	75.880
7	1.255	36.92	2.670	78.550
8	0.996	37.91	2.118	80.668

Table 2 displayed the Principal Component Analysis result, demonstrating that the procedure has extracted eight components with the total variance explained for the eight components to be 80.67%. For a construct to be valid, the total variance explained should be greater than the recommended sixty percent, hence validating the constructs of the study. This is in agreement with the scree plot produced from the analysis.

The initial eigenvalues indicated that the first four factors explained 40.5%, 14.8%, 9% and 4.4% of the variance respectively. The fifth, sixth, and seventh factors had eigenvalues just over one, explaining 3.7%, 3.5%, and 2.7% of variance respectively, while the eighth factor explained 2.1% of the variance. Solutions for the eight factors were examined using varimax rotation.

Table 3 presents the final EFA result which yielded a factor solution with no cross-loadings. The factor structure was compared with the survey items, in the process of naming the factors (Table 4). All the loadings appear to make sense and named based on the factors identified in the literature. It was noted that several authors suggest to have at least 3 items under each factor (Meyers et al., 2013; Stage et al., 2004; Tabachnick & Fidell, 2007). The final factor structure achieved 6 items under attitude (ATT), 6 items under subjective norms (SN), 6 items under perceived behavioral control (PBC), 3 items under personal moral norm (PMN), 5 items under environmental concern (EC), 7 items under situational factors (SF), 8 items under perceived policy effectiveness (PPE), and 6 items under intention (INT), taken together to be tested empirically as the factors determining sustainable food waste management behavior.

Table 3: Final EFA Result

Rotated Component Matrix								
	Component							
	1	2	3	4	5	6	7	8
PPE_1	0.923							
PPE_2	0.916							
PPE_3	0.895							
PPE_4	0.884							
PPE_5	0.855							
PPE_6	0.852							
PPE_7	0.833							
PPE_8	0.788							
ATT_1		0.827						
ATT_2		0.819						
ATT_3		0.804						
ATT_4		0.801						
ATT_5		0.744						
ATT_6		0.669						
INT_1			0.783					
INT_2			0.767					
INT_3			0.760					
INT_4			0.745					
INT_5			0.729					
INT_6			0.688					
EC_1				0.839				
EC_2				0.838				
EC_3				0.828				
EC_4				0.804				
EC_5				0.775				
SF_1					0.832			
SF_2					0.813			
SF_3					0.808			
SF_4					0.796			

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SF_5					0.796			
SF_6					0.791			
SF_7					0.775			
SN_1						0.841		
SN_2						0.823		
SN_3						0.791		
SN_4						0.682		
SN_5						0.650		
SN_6						0.612		
PBC_1							0.708	
PBC_2							0.682	
PBC_3							0.680	
PBC_4							0.667	
PBC_5							0.631	
PBC_6							0.624	
PMN_1								0.788
PMN_2								0.602
PMN_3								0.552

Table 4: Measurement Items

Construct	**Items**
Attitude (Ru et al., 2018)	I think that practicing SFWM is interesting.
	I think that practicing SFWM is a good idea.
	I think that practicing SFWM is important.
	I think that practicing SFWM is beneficial.
	I think that practicing SFWM is wise.
	I think that practicing SFWM is favourable.
Subjective norms (Aktas et al., 2018; Karim Ghani et al., 2013)	My family would think I should practice SFWM at home.
	My neighbours would think I should practice SFWM at home.
	My friends would think I should be involved in SFWM at home.
	My colleagues would think I should be involved in SFWM activities at home.
	The community in the area I live thinks I should practice SFWM.
	People important to me think my efforts towards reducing food waste are necessary.
Perceived behavioral control (Karim Ghani et al., 2013; Ru et al., 2018)	Practicing SFWM would be an easy task for me.
	I have complete control in deciding whether or not to practice SFWM at home.
	If I wanted to, I could practice SFWM at home.
	I think I am capable of practicing SFWM at home.
	I believe I have the skills to practice SFWM at home.
	The decision to practice SFWM at home is completely up to me.
Personal moral norms (Ru et al., 2018; Wang et al., 2019)	I would feel unhappy if I don't attempt to prevent food waste in my daily life.
	Not practising SFWM would violate my moral principles.
	My personal values encourage me to reduce household food waste from entering landfills.
Environmental concern (Hamzah & Tanwir, 2021; Li et al., 2020)	I am worried about the state of Malaysia's unsanitary landfills and environmental pollution.
	I am concerned that the release of harmful gases generated by food waste to the environment will affect human health.
	Reducing food waste from entering landfills is necessary for environmental reasons.
	Excessive food waste generation will bring many environmental problems.
	I think individuals have a responsibility to protect the environment from the food waste problem.
Situational factors (Heidari et al., 2018; Zhang et al., 2015)	Not having enough space in my house would make it difficult for me to practice SFWM.
	Not having enough time to properly separate my food waste and do composting would make it difficult for me to practice SFWM.
	Lack of waste containers and composting bins would make it difficult for me to practice SFWM.
	Inadequate and unavailable facilities would make it difficult for me to practice SFWM.
	I would be less motivated if SFWM brings additional costs to me.
	I would be less motivated if SFWM attracts pests.
	I would be less motivated if SFWM produces bad odour.
	Bins provided by the Government are sufficient to facilitate SFWM at home.

Perceived policy effectiveness (Wan et al., 2014)	The programs organized related to food waste management effectively increases my awareness about the issue.
	There are clear guidelines on waste separation and recycling.
	Dissemination of promotions and campaigns help me to understand the importance of waste separation at home.
	The Government's policy encourages me to practice SFWM at home.
	The Government's policy facilitates me to practice SFWM at home.
	The Government attaches great importance to the food waste problem.
	The Government has been actively advocating efforts to manage the food waste problem.
Intention (Liao et al., 2018; Wan et al., 2014)	I intend to practice SFWM in the near future.
	I plan to participate in SFWM at home in the near future.
	I am willing to participate in SFWM practices in the near future.
	I will make an effort in the near future to practice SFWM at home.
	From here on, I aim to separate my household food waste.
	From here on, I will manage my leftover food.

Source: Author and publication year as mentioned beside each constructs.

Reliability analysis

An instrument can be reliable but not valid, although it cannot be valid if it is not reliable (Jackson, 2003). In other words, if an instrument is valid, it must be reliable. Reliability differs than validity in that it refers not to what should be measured but how it is measured. Reliability is defined as the extent of consistency to which a variable or a set of variable intends to measure (Hair et al., 2019). There are many ways of estimating reliability which are inter-rater reliability, test-retest reliability, split-half reliability, or internal consistency reliability. The most widely used measure of reliability is the Cronbach's alpha, a measure of internal consistency reliability which assumes equal or unweighted indicator loadings. In other words, it assesses the consistency of the entire scale to test the construct's reliability in research. The Cronbach's alpha is designed by Cronbach (1951), where K is the number of items, σ_X^2 is the variance (square of standard deviation) of the observed total scores, and $\sigma_{Y_i}^2$ is the observed variance for item i.

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum_{i=1}^{K}\sigma_{Y_i}^2}{\sigma_X^2}\right)$$

The value ranges from 0 to 1. An alpha value above 0.7 is the recommended level (Nunnally, 1978) and by convention has been the acceptable level in many previous studies (Aliabadi et al., 2020; Ramalingam et al., 2018; Shalender & Sharma, 2021). Overall, the constructs in the current study achieved acceptable Cronbach's alpha value ranging from 0.860 to 0.979, indicating that all constructs have good internal consistency. Thus, it was not required to refine any of the items. In fact, the output from the SPSS scale reliability analysis did not indicate that removing any item would give any significant improvement of the overall scale. Hence, the result declared that the measuring items for each construct were deemed satisfactory. Table 5 below displays the values for mean, standard deviation and Cronbach alpha for all constructs in the study.

Table 5: Descriptive and Reliability Results

Construct	Number of items	Mean	SD	Cronbach alpha
Attitude	6	37.39	5.037	0.951
Subjective norms	6	33.36	6.561	0.943
Perceived behavioral control	6	32.33	6.130	0.894
Personal moral norms	3	17.58	3.099	0.860
Environmental concern	5	31.91	4.174	0.966
Situational factors	7	39.70	8.200	0.913
Perceived policy effectiveness	8	38.03	12.555	0.962
Intention	6	35.40	6.095	0.979

There was no doubt that the items offered a solid conceptual structure on which to examine the explanatory basis of the SFWM behavior. The Cronbach alpha statistics show all scales provide a good basis for analyzing the data from the questionnaire within the conceptual framework.

5. CONCLUSION

The article has provided guidance on the steps taken in conducting a pilot study. It is crucial step to run a pilot study before conducting the actual study on sustainable food waste management (SFWM) behavior among urban residents. The positive response rate shows that individual member of the household being the unit of analysis, can easily understand and answer the survey. The positive response rate also confirmed the content and face validity of the data collection instrument, thus can be used for a larger scale investigation in the future. The feasibility of the instrument to be used among the study sample during the actual main study was a crucial outcome. Validating the items via EFA provides assurance that the measurement tool is valid. Moreover, the findings from the internal consistency analysis confirms the reliability of the measures used. The pilot study also managed to show that it was a conducive way to conduct a web-based survey for data collection. The importance of carefully organizing a pilot study has been highlighted in this study in order to increase the research quality and establish best practices, particularly in food waste management research, and generally in behavioral research. Finally, it was evident that in the SFWM study context, the extended model based on the TBP theory, could be a useful research framework in assessing the constructs determining households' intention and behavior of practicing sustainable food waste management. This paper emphasizes the value of pilot studies in improving research design and adding to the existing literature towards increasing the

likelihood of success in main studies particularly in the sustainable food waste management research context.

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