

Recycling intentions and behaviors among informal micro-entrepreneurs in Kelantan, Malaysia

Recycling intentions and behaviors

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Abstract

Purpose – As recycling is associated with various environmental benefits, it is important that it is encouraged in Malaysia. Taking the disappointingly low recycling rate in Malaysia as its backdrop, the purpose of this paper is to examine recycling intentions and behaviors among micro-entrepreneurs in Kelantan, Malaysia, drawing on the theory of planned behavior.

Design/methodology/approach – The study adopted a cross-sectional design and stratified random sampling method to select 200 informal micro-entrepreneurs from Kota Bharu, Kelantan; then, quantitative data were collected through structured interviews. For data analysis, this study adopted variance-based structural equation modeling, i.e. PLS-SEM.

Findings – The findings indicated that environmental awareness had a significant positive effect on micro-entrepreneurs' attitudes toward the environment. They also confirmed a positive and significant effect of attitude and perceived behavioral control on intention toward recycling and the effect of intention toward recycling on recycling behavior among the study sample.

Practical implications – Policies and programs focused on environmental awareness could nurture a positive attitude toward the environment, which, together with the capacities and resources available, could significantly influence the adoption of recycling behavior among informal entrepreneurs.

Originality/value – It is recommended that both public and private environmental protection and socio-economic development organizations combine their efforts to formulate and enforce policies and programs to promote recycling behavior among Malaysian entrepreneurs, which could spread the recycling spirit among all Malaysians.

Keywords Theory of planned behaviour, Recycling behaviour, Recycling intention

Paper type Research paper

1. Introduction

Most developed nations show concern for environmental deterioration, and this often shapes their policies and economies (Ramayah *et al.*, 2010). Environmental deterioration has been made plain by the emergence of several environmental dilemmas worldwide, such as global warming, climate change, pollution and acid rain, all of which have been at worrying levels for quite some time (Salleh *et al.*, 2016). In particular, climate change, landfills, uncertainty in terms of future accessibility of fossil fuels and the significant quantity of carbon emissions have been extensively recognized as the biggest issues of the present



century (Sang and Bekhet, 2015). In Malaysia, climate change increases economic vulnerability, thereby reducing agricultural productivity and food security (Afroz, 2017; Al-Amin *et al.*, 2010). Roy and Pal (2009) highlighted that consumerism and lifestyle decisions are the key drivers of anthropogenic climate change, and this is why environmental issues have emerged as significant concerns not only for governments and societies, but also for businesses (Eltayeb *et al.*, 2010).

Recycling, as a universally accepted method of waste disposal and minimalization, effectively reduces the consumption of natural resources and energy (Ramayah *et al.*, 2010; Chan and Bishop, 2013). According to Mahmud and Osman (2010), recycling is the most suitable and significant strategy for overcoming certain environmental problems, such as overloaded landfills. Chen and Tung (2010) noted that recycling is one of the most popular solutions for minimizing municipal solid waste, as it not only reduces waste, but also transforms waste materials into valuable resources, thereby generating a number of economic, environmental and social benefits. This is why governments throughout the world have enforced laws and set-up garbage reduction and recycling programs to reduce resource wastage and create a sustainable environment for future generations.

Public awareness of recycling among Malaysians still remains low compared to their developed neighbor, Singapore, and similar countries; although Malaysia has bravely targeted an ambitious 22 percent recycling rate by the year 2020 (Ramayah *et al.*, 2012). According to Kathirvale *et al.* (2004), on average 0.5–0.8 kg/person/day of municipal solid waste is generated in Malaysia, and the figure could be as high as 1.7 kg/person/day in major cities. It has been reported that on average half of local authorities' operating budgets are exhausted on municipal solid waste, and of this more than half is expended on waste collection. It is perceived that a lack of synchronization between relevant agencies and residents in regards to waste management, underutilization of resources, unsustainable waste management programs, inadequate household participation, insufficient skilled manpower, a lack of waste collection equipment, irregular collection services, a lack of legal provisions and constraints of other necessary resources are the key factors behind the current waste recycling dilemma in Malaysia (Ramayah *et al.*, 2012).

An effective recycling program requires initiative and cooperation from both the government and the residents, particularly business owners, who play a substantial role in supplying consumables to the general public. Informal micro-enterprises are one such business entity, carrying out economic activities outside of formal institutional limitations but within informal institutional borders. They cater to large communal groups by engaging low-paid employees as waged workers and thereby play a significant role in national economic development (Al Mamun *et al.*, 2016; Webb *et al.*, 2013). In Malaysia, it was reported that 11.4 percent of non-agricultural employment was in the informal sector in 2015 compared to 11.2 percent in 2013. Numerically, employment in the informal sector was 1.40m employees in 2015, an increase of 79,300 employees (6.0 percent) compared to 1.3m employees in 2013. The status of employment in the informal sector in 2015 by own workers or self-employed is 55.1 percent higher than employers, employees and unpaid family workers. Meanwhile, the informal sector by industry consists of 19.2 percent in accommodation, and food and beverage service activities, and 10.7 percent in wholesale and retail trade (Department of Statistics, 2015). Although both developed and developing nations host informal economies and related enterprises, informal micro-enterprises have been found to act as engines of economic dynamism in developing economies such as Malaysia, where a significant proportion of micro-entrepreneurs operate within the informal economy of the country (Al Mamun *et al.*, 2016).

Although recycling programs in Malaysia have been widely active since 1993, to date the recycling rate of 5 percent seems unimpressive for a country where more than 30 percent of garbage is recyclable (Mahmud and Osman, 2010; Ramayah *et al.*, 2010). On the other hand, it is predicted that by 2020 the quantity of municipal solid waste generated in Malaysia will reach

approximately 31,000 tons, making it much more difficult for local governments to achieve a sustainable recycling rate; they will then need to shoulder heavier responsibilities as landfills will have become even scarcer (Ramayah *et al.*, 2012). It has been predicted that as a result of the globalization of businesses and education-influenced values, the consumption patterns of present generations aged between 15 and 54, constituting 57 percent of the local population in Malaysia, will come to follow their counterparts in developed economies (Ropke, 1999, 2009), which will involuntarily impact the environment and environment-related issues such as recycling and conservation (Ramayah *et al.*, 2010). Since environmental sustainability issues are related to consumption patterns, this study attempts to examine the recycling intentions and behaviors of informal business entrepreneurs in Kelantan, Malaysia, who cater to large communal groups by providing everyday consumables, and hence are assumed to be a significant component of the recycling issue.

2. Literature review

2.1 Theoretical foundation

Psychological theories such as the theory of planned behavior (TPB) can lead to a better understanding of how intention to perform or restrain a certain behavior is formed and how such an intention results in actual behavior. The TPB has been found to be one of the most suitable primary theory-driven models for explaining recycling intention in the present context. Accordingly, the TPB focuses on the role of intentions and their strength in predicting focal behavior and thereby forwarding that action by an individual in a way that is generally guided by attitudes and subjective norms. Also, perceived behavioral control can collectively predict intentions, while intentions, in turn, predict behavior. Moreover, according to Ajzen (1991), there exist certain salient beliefs that are regarded as the fundamental determinants of an individual's intentions and actions, namely, behavioral beliefs, normative beliefs and control beliefs.

The TPB puts forward a framework for examining the factors that affect behavioral choices systematically and has been successfully applied in recycling studies (e.g. Chan, 1998; Shaw, 2008; Begum *et al.*, 2009; Chen and Tung, 2010). As recycling is a behavior that requires substantial effort on the part of the individual (for sorting, preparing and storing waste materials), it is likely that the recycling decisions are complex, and several factors ought to be considered (Ramayah *et al.*, 2012). Although it is agreed that the theoretical framework of the TPB allows for identifying factors that influence recycling decisions systematically, and its usefulness has been confirmed by several studies that investigated the antecedents of recycling behavior, some scholars have argued that it does not sufficiently explain recycling behavior and have stressed that additional constructs need to be included in the existing model for such a purpose (Davies *et al.*, 2002; Tonglet *et al.*, 2004). Ajzen's (1991) findings support the notion that the TPB allows for the integration of additional constructs, provided they significantly contribute to the explanation of behavior as forwarded by the extended model. Therefore, this study integrates an additional variable of environmental awareness that leads to relevant attitudes toward the environment, in addition to examining the roles of attitudes, social norms and perceived behaviors in the recycling intentions and behaviors of micro-entrepreneurs in Kelantan, Malaysia, within the scope of the TPB.

2.2 Environmental awareness and attitudes toward the environment

Research findings convey that specific knowledge of recycling positively and significantly influences individuals' attitudes (Kelly *et al.*, 2006). Several environmentalists have further acknowledged that environmental pollution can be minimized by means of environmental awareness, which could, in turn, facilitate the sustainable consumption of resources (Ali and Sinha, 2013). In addition, environmental awareness had a significant influence on the intention to recycle (Elayan and Ibrawish, 2017) and attitude toward green products (Danish and Naved, 2016). In Malaysian context, recent research revealed that students in the country

possess high levels of environmental knowledge and awareness, which nurtures positive attitudes toward environmental issues (Aminrad *et al.*, 2013). Moreover, according to Sidique, Joshi and Lupi (2010), education and communication efforts targeted at improving recycling awareness can persuade individuals to become involved in recycling. In general, the existing literature agrees that a significant positive relationship exists between environmental awareness and attitudes (e.g. Ramayah *et al.*, 2012). However, the few existing studies report no significant effect of a conceptual understanding of one's surrounding environment on their enthusiasm to conserve the environment (Omran and Gebri, 2011; Said *et al.*, 2007). In a recent study on similar issues in Malaysia, it was highlighted that even individuals possessing high levels of environmental awareness failed to act and/or practice certain attitudes that could improve their surroundings (Hassan *et al.*, 2010). The varied findings call for a deeper examination of this issue. Considering the above, the present study perceives environmental awareness as a significant predictor of attitudes toward the environment, and therefore hypothesizes the following:

H1a. Environmental awareness has a significant and positive effect on attitudes toward the environment among micro-entrepreneurs in Kelantan, Malaysia.

2.3 Attitude toward the environment and recycling intention

"Attitude" refers to an individual's perception of a behavior being right or wrong, useful or useless, good or bad, pleasant or unpleasant, desirable or undesirable and interesting or boring (Ramayah *et al.*, 2012). According to the TPB, one's attitude reflects their overall evaluation of a specific behavior, wherein that behavior could be perceived as the degree to which an individual possesses a favorable or unfavorable evaluation or appraisal of the behavior in question. Attitude signifies perceptions of personal desirability and involves beliefs and expectations about personal impacts as a result of outcomes originating from a certain behavior (Krueger *et al.*, 2000). The relationship between attitude and intention can be theoretically explained by the TPB, which states that attitude, along with subjective norms and perceived behavioral control, influences intention (Ajzen, 1991).

Empirical evidence also supports the notion that one's attitude is the most important determinant of their behavior (Chan, 1998). Several existing studies have revealed that attitude and personality traits not only have significant effects but also have the strongest influence on business start-up intentions (Frank *et al.*, 2007; Sesen, 2013). In the context of recycling, Ajzen and Fishbein (1977) posited that recycling-specific attitudes should better predict recycling intentions than general environmental attitudes. In particular, Nigbur *et al.* (2010) found that attitude significantly predicts the intention to recycle. Ramayah *et al.* (2012) and Al Mamun *et al.* (2018) reestablished that attitude is positively related to recycling behavior. Therefore, considering the above, this study posits the following:

H1b. Attitudes toward the environment have a significant and positive effect on recycling intention among micro-entrepreneurs in Kelantan, Malaysia.

2.4 Subjective norms and recycling intention

Subjective norms reflect the perceived social pressures upon an individual to perform or not perform a certain behavior (Ajzen, 1991). Subjective norms usually originate from peer pressure, friends or family, requiring individuals to comply with certain pre-specified norms. The underlying antecedents of subjective norms are established by normative beliefs, wherein such beliefs are associated with the possibility that significant referent groups or individuals support or oppose a particular behavior (Veciana *et al.*, 2005). The opinion of significant people in an individual's life influencing him/her to perform a particular behavior promotes "perceived social pressure" (Ajzen, 1991), which may improve or restrain a particular behavior.

Empirically, the relationship between subjective norms and intention was proved by a study on young Australians that revealed that attitudes toward entrepreneurship and the

decision to initiate a business venture were significantly influenced by referent groups, such as friends (Keat *et al.*, 2011). In the context of recycling, quite a few existing studies explain that recycling behavior by an individual is significantly influenced by the social norms that they perceive as being possessed by social groups or other persons that are important to them (DoValle *et al.*, 2004; Shaw, 2008). Although, in general, earlier studies based on the TPB widely acknowledge subjective norms as a significant predictor of intention, some scholars tend to differ; however, they have failed to find any significant association between subjective norms and intentions (Krueger *et al.*, 2000). Hence, based on the above, this study hypothesizes the following:

- H2. Subjective norms have a significant positive effect on recycling intention among the micro-entrepreneurs of Kelantan, Malaysia.

2.5 *Perceived behavioral control and recycling intention*

“Perceived behavioral control” refers to the perceived difficulty or ease of performing a behavior, which is presumed to reflect anticipated impediments, obstacles and past experiences (Ajzen, 1991). The construct of perceived behavioral control is quite similar to the dimension of self-efficacy and therefore denotes an individual’s perception of their capability to perform a specific behavior (Bandura, 1986; Ajzen, 1987). As control beliefs constitute the basis for perceptions of behavioral control, there exists a preconceived notion that deals with the existence or nonexistence of required resources and opportunities (Ajzen, 1987). Where intentions reflect willingness to pursue a specific behavior, perceived control takes into account realistic limitations and constraints that might exist (Boyd and Vozikis, 1994). As such, when individuals believe that they possess adequate opportunities and resources, and anticipate few impediments or obstacles, their perceived control over the relevant behavior should be greater (Ajzen, 1991).

In terms of recycling, the availability and convenience related to recycling infrastructure (as a required resource/opportunity) may positively influence an individual’s recycling behavior (Ramayah *et al.*, 2012). According to McDonald and Ball (1998), major reasons reported by respondents for not recycling included the inadequacy of necessary facilities, lack of time, inconvenience, storage/handling problems and distance to recycling centers. Moreover, Sidique, Lupi and Joshi (2010) also stressed that the ease of reaching recycling drop-off sites was a key factor of recycling behavior. Furthermore, Sidique, Joshi and Lupi (2010) illustrated that the cost of recycling, along with space/time availability, and the ease of performing recycling-related tasks, were components of perceived available resources/opportunities that influenced recycling behavior. Therefore, considering the above, this study acknowledges perceived behavioral control as a key determinant of recycling intention and posits the following hypothesis:

- H3. Perceived behavioral control has a significant positive effect on recycling intention among the micro-entrepreneurs of Kelantan, Malaysia.

2.6 *Recycling intention and behavior*

Following the TPB, recycling intention in the present context represents the construct of intention from the model, whilst recycling behavior reflects the construct of behavior. It is only rational to assume that no behavior may exist without intention. Theoretically, the TPB confirms that intentions are the best predictors of behavior, wherein stronger intention indicates a higher possibility of the concerned behavior occurring (Ajzen, 1991). Empirically as well, there exists considerable agreement in the relevant literature on the

ability of intentions to predict behavior (Marques *et al.*, 2012). Related research portrays intention as the antecedent of behavior (Linan *et al.*, 2005). Therefore, it is expected that recycling intention predicts and leads to recycling behavior. Hence, the following hypothesis is proposed:

- H4. Recycling intention has a significant positive effect on recycling behavior among the micro-entrepreneurs of Kelantan, Malaysia.

2.7 The mediating effect of recycling intention

The present study conceptualizes attitudes toward the environment, subjective norms and perceived behavioral control as significant predictors of recycling intention in accordance with the TPB. Following the theory, this study simultaneously articulates a relationship between recycling intention and recycling behavior. Hence, it is rationally expected that recycling intention should significantly mediate the association of attitudes toward the environment, subjective norms and perceived behavioral control with recycling behavior among informal micro-entrepreneurs in Kelantan, Malaysia. Therefore, this study puts forward the following hypothesis:

- H5. Recycling intention mediates the effect of attitudes toward the (a) environment, (b) subjective norms and (c) perceived behavioral control on recycling behavior among the micro-entrepreneurs of Kelantan, Malaysia.

3. Research methodology

This study was designed to investigate the effect of attitudes toward the environment, subjective norms and perceived behavioral control on intention toward recycling and recycling behavior among informal micro-entrepreneurs in Kelantan, Malaysia. All association hypothesized and tested are presented in Figure 1. The questionnaire was created using straightforward wording so the respondents could easily comprehend the questions and deliver high-quality answers based on their experiences and perceptions. A total of four questions were used to measure “environmental awareness”; they were adopted from a study conducted by Steg *et al.* (2005), with minor modifications. In total five questions were used to measure “attitude toward recycling,” five to measure “subjective norms,” four to measure “perceived behavioral control” and four to measure “recycling intention”; they were adopted from an earlier study conducted by Chen and Tung (2010), with minor modifications. A total of seven questions were used to measure “recycling behavior”; they were adopted from a study conducted by Shrestha (2014), with minor modifications. A standardized five-point Likert scale (where 1 = “strongly disagree” and 5 = “strongly agree”) was used to measure the independent, mediating and dependent variables.

The sample size for this study was calculated using G-Power version 3.1. Based on the power of 0.95 (which is more than 0.80, as required in social and behavioral science research) with an effect size of 0.15, this study needed a sample size of 138 to test the model with 5 predictors. Furthermore, a study conducted by Reinartz *et al.* (2009) identified a minimum threshold of 100 samples for the PLS-SEM. Furthermore, as mentioned by Chin (2010), the minimum sample size should be ten times that of the largest number of paths in the structural or measurement models; so the sample size for this study needed to be at least 50. To avoid any possible complications that can originate from a low sample size, this study collected data from 200 informal micro-entrepreneurs from Kelantan, Malaysia.

The study adopted a cross-sectional design and collected quantitative data from 200 informal micro-entrepreneurs (selected from a list of 1,012) using a stratified random sampling method. Among the 200 respondents, 55 of them were from Wakaf Che Yeh,

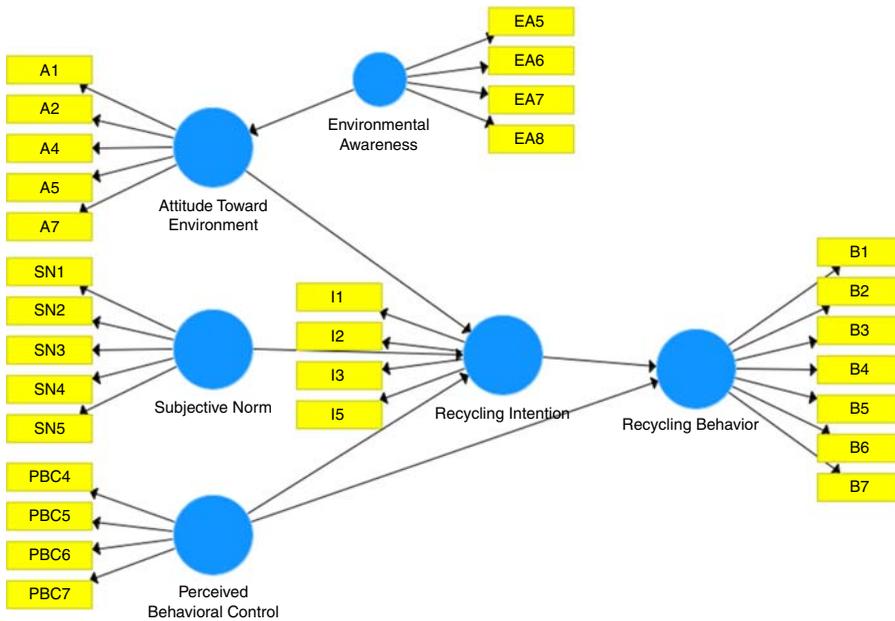


Figure 1. Research model

33 from Padang Tembak, 10 from Pasir Tumbuh, 23 from Berek 12, 13 from Hadapan HUSM, 4 from Kg Sireh, 28 from Taman Bendahara, 10 from Julam Mustapha and 24 from Lundang. Data were collected through face-to-face structured interviews.

3.1 Common method variance

Common method variance refers to systematic measurement error, originating from features that are intended to represent the construct of interest, and the characteristics of the specific method being employed, which may be common to measures of other constructs (MacKenzie and Podsakoff, 2012). To minimize the effect of common method bias, besides carefully constructing the items, in terms of procedural remedies this study also informed the respondents that their responses would be evaluated anonymously and that there were no right or wrong answers before the structured interviews (see Podsakoff *et al.*, 2003). For the statistical remedy, this study adopted Harman's (1976) one-factor test as recommended by Podsakoff *et al.* (2003), in which one fixed factor is extracted from all principle constructs and is expected to explain less than 50 percent of the variance. The findings of this study showed that component one explained 30.34 percent of the variance, which is less than the maximum threshold of 50 percent. Furthermore, a correlation between constructs of more than 0.9 is considered an indicator of common method bias (Bagozzi *et al.*, 1991). Here, the highest correlation between the constructs was 0.683 (recycling intention and recycling behavior), which indicated a lack of common method bias in the collected data.

3.2 Multivariate normality

Even though the partial least squares (PLS) method does not require a multivariate normal data distribution, Peng and Lai (2012) argued against making generalized statements regarding the ability of PLS to estimate models that may violate the multivariate normality assumption. Therefore, this study tested the multivariate normality using an online tool named Web Power. Web Power calculated the Mardia's multivariate skewness and kurtosis coefficients and

p-values. The findings showed that the Mardia's multivariate skewness coefficient was 12.11 with a *p*-value of 0.00, which confirmed the non-normality. Moreover, the kurtosis coefficient for this model was 63.59 and the *p*-value less than 0.05, which also confirmed the non-normality.

3.3 Data analysis method

Due to the exploratory nature of this study and the non-normality issue, this study used variance-based structural equation modeling, i.e. PLS estimation, with the primary objective of maximizing the explanation of variance in the structural equation model's dependent constructs. The findings of this analysis will be reported as per the recommendation by Hair *et al.* (2013) for PLS modeling. These include the indicator reliability (e.g. standardized indicator loadings 0.70; in exploratory studies, loadings of 0.40 are acceptable); internal consistency reliability (Cronbach's α and composite reliability – both measures should exceed 0.70); convergent validity (average variance extracted (AVE) \geq 0.50); discriminant validity (cross-loadings); r^2 (acceptable level depends on the research context); effect size or f^2 (0.02, 0.15 and 0.35 for weak, moderate and strong effects, respectively); path coefficient estimates; and predictive relevance Q^2 ($Q^2 > 0$ is indicative of predictive relevance).

4. Results

The demographic characteristics of the sampled informal micro-entrepreneurs and micro-enterprises are presented in Table I. As noted in the table, among the selected 200 informal micro-entrepreneurs, 57.5 percent were male and 42.5 percent female. As for education, more than 80 percent of the selected respondents gave their level of education as *Sijil Pelajaran Malaysia* (SPM; Malaysian Certificate of Education) or below. Around 50 percent of the entrepreneurs were under 40 years old, and 64 percent of them were currently married. A total of 33 percent of the micro-enterprises started less than 5 years ago, and around 66 percent less than 10 years ago.

4.1 Reliability and validity

The criteria used to evaluate the reliability of the items employed by this study are presented in Table II. These criteria include Cronbach's α , composite reliability, and AVE. Cronbach's

	<i>n</i>	%		<i>n</i>	%
<i>Gender</i>			<i>Age (years)</i>		
Male	115	57.5	Less than 30	53	26.5
Female	85	42.5	30–39	54	27.0
Total	200	100	40–49	52	26.0
			50–59	31	15.5
<i>Education</i>			60 or above	10	5.0
SPM	83	41.5	Total	200	100.0
Diploma	17	8.5			
Degree	16	8.0	<i>Marital Status</i>		
Master	2	1.0	Single	59	29.5
Others	82	41.0	Married	128	64.0
Total	200	100.0	Divorced	5	2.5
			Separated	3	1.5
<i>Firm established (years ago)</i>			Widowed	4	2.0
1–5	66	33.0	Living Together	1	0.5
5–10	67	33.5	Total	200	100.0
10–15	27	13.5			
15–20	23	11.5			
20–25	12	6.0			
Over 25	5	2.5			
Total	200	100.0			

Table I.
Profile of
the respondents

Table II. Reliability and validity

Variable	Items	Mean	SD	CA	DG ρ	CR	AVE	VIF
EA	4	4.1225	0.71943	0.704	0.739	0.816	0.527	1.000
AE	5	4.1110	0.71134	0.817	0.837	0.871	0.576	1.074
SN	5	3.8450	0.73161	0.849	0.879	0.890	0.620	1.548
PC	4	3.9775	0.69329	0.785	0.786	0.861	0.608	1.551
RI	4	4.0775	0.60431	0.697	0.697	0.815	0.525	1.000
RB	7	3.7657	0.68220	0.837	0.848	0.877	0.507	–

Notes: EA, environmental awareness; AE, attitude toward environment; SN, subjective norms; PC, perceived behavioral control; RI, recycling intention; RB, recycling behavior; CA, Cronbach's α ; DG ρ , Dillon–Goldstein's ρ ; CR, composite reliability; AVE, average variance extracted; VIF, variance inflation factors

Source: Authors own compilation

α values for all indicators were more than 0.7, which means all of the items used were reliable. Moreover, the Dillon–Goldstein's ρ values for all indicators were more than 0.7, confirming that all the items used were reliable. As for composite reliability, the value for all indicators was more than 0.7, representing reliable items. In terms of the AVE, the value should be higher than 0.50, and as noted in Table I, all of the AVE values for the constructs were higher than 0.50, which indicated acceptable convergent validity. Finally, to report the multicollinearity issue, this study also tested the variance inflation factors (VIF). The VIF values for all variables were below 3.3, indicating that multicollinearity was not severe (see Diamantopoulos and Siguaw, 2006).

The Fornell–Larcker criterion assesses discriminant validity at the construct level. As seen in Table III, for all variables, the items loadings on their own variable were higher than all of their cross-loadings with all other variables; therefore, no lack of discriminant validity was determined. Furthermore, the Heterotrait–Monotrait ratio, as an estimate of the correlation between constructs, parallels the disattenuated construct score creation. Using a value of 0.9 as the threshold (see Teo *et al.*, 2008), this study concluded that there was no evidence of a lack of discriminant validity and all of the constructs met the criteria.

4.2 Path analysis

Path coefficients were estimated as path relationships in the structural model between the constructs in the model. As can be observed in Table IV, the path coefficients of environmental awareness were found to have a positive and statistically significant effect on attitude toward the environment (at the chosen 5 percent level of significance). Furthermore, attitude toward the environment and perceived behavioral control were also found to have a positive and statistically significant effect on recycling intention (at the chosen 5 percent level of significance). However, subjective norms were found to have no statistically significant effect on recycling intention, despite displaying a positive relationship. Finally, recycling intention was also found to have a positive and statistically significant effect on recycling behavior (at the chosen 5 percent level of significance).

According to the effect sizes (f^2) in Table IV, environmental awareness was found to have small effects on attitude toward the environment. Moreover, attitude toward the environment and subjective norms exhibited small effects on recycling intention, while perceived behavioral control displayed a medium effect on recycling intention among the sample. Moreover, recycling intention was found to have a large effect on recycling behavior. The coefficient of determination (r^2) of all endogenous latent variables, as shown in Table IV, was considered moderate and therefore acceptable, as this study was not designed to identify the key factor affecting recycling intention; rather, it only attempted to identify how different constructs related to the TPB model affect recycling intention and behavior among the respondents. The Q^2 value assesses the relative predictive relevance of a predictor construct on an endogenous construct value,

	EA	AE	SN	PC	RE	RB
Environmental awareness – Item 1	0.653	0.156	0.196	0.225	0.245	0.301
Environmental awareness – Item 2	0.689	0.166	0.211	0.341	0.199	0.265
Environmental awareness – Item 3	0.822	0.255	0.259	0.256	0.344	0.365
Environmental awareness – Item 4	0.730	0.179	0.211	0.207	0.273	0.291
Attitude toward environment – Item 1	0.188	0.813	0.115	0.189	0.210	0.233
Attitude toward environment – Item 2	0.186	0.824	0.073	0.118	0.192	0.229
Attitude toward environment – Item 3	0.113	0.635	0.089	0.083	0.109	0.088
Attitude toward environment – Item 4	0.250	0.788	0.250	0.247	0.242	0.245
Attitude toward environment – Item 5	0.237	0.719	0.300	0.207	0.174	0.309
Subjective norm – Item 1	0.228	0.192	0.778	0.429	0.281	0.547
Subjective norm – Item 2	0.281	0.198	0.831	0.465	0.424	0.543
Subjective norm – Item 3	0.181	0.141	0.704	0.400	0.200	0.307
Subjective norm – Item 4	0.285	0.137	0.815	0.498	0.296	0.508
Subjective norm – Item 5	0.205	0.230	0.801	0.513	0.347	0.567
Perceived behavioral control – Item 1	0.234	0.222	0.432	0.744	0.426	0.406
Perceived behavioral control – Item 1	0.291	0.156	0.418	0.776	0.445	0.498
Perceived behavioral control – Item 1	0.296	0.181	0.476	0.791	0.393	0.580
Perceived behavioral control – Item 1	0.268	0.179	0.506	0.807	0.448	0.567
Recycling intention – Item 1	0.340	0.201	0.199	0.396	0.767	0.510
Recycling intention – Item 2	0.365	0.222	0.184	0.348	0.777	0.520
Recycling intention – Item 3	0.231	0.054	0.401	0.311	0.657	0.492
Recycling intention – Item 4	0.156	0.242	0.399	0.514	0.691	0.495
Recycling behavior – Item 1	0.376	0.204	0.506	0.473	0.598	0.795
Recycling behavior – Item 2	0.228	0.209	0.468	0.431	0.374	0.623
Recycling behavior – Item 3	0.339	0.154	0.484	0.483	0.460	0.746
Recycling behavior – Item 4	0.322	0.080	0.561	0.508	0.543	0.752
Recycling behavior – Item 5	0.338	0.179	0.404	0.506	0.536	0.695
Recycling behavior – Item 6	0.269	0.400	0.411	0.407	0.516	0.724
Recycling behavior – Item 7	0.206	0.342	0.372	0.481	0.390	0.632
<i>Fornell–Larcker criterion</i>						
Environmental awareness	0.726					
Attitude toward environment	0.268	0.759				
Subjective norms	0.305	0.233	0.787			
Perceived behavioral control	0.349	0.236	0.587	0.780		
Recycling intention	0.373	0.254	0.412	0.551	0.725	
Recycling behavior	0.424	0.306	0.644	0.657	0.697	0.712
<i>Heterotrait–Monotrait ratio (HTMT)</i>						
Environmental awareness	–					
Attitude toward environment	0.326	–				
Subjective norms	0.383	0.267	–			
Perceived behavioral control	0.476	0.280	0.716	–		
Recycling intention	0.527	0.325	0.510	0.731	–	
Recycling behavior	0.538	0.368	0.744	0.816	0.897	–

Notes: EA, environmental awareness; AE, attitude toward environment; SN, subjective norms; PC, perceived behavioral control; RI, recycling intention; RB, recycling behavior. The bold and italic values in the matrix above are the item loadings and others are cross-loadings

Source: Authors own compilation

Table III.
Discriminant validity

and a value larger than 0 indicates that the path model’s accuracy is acceptable (Hair *et al.*, 2013). As seen in Table IV, the Q^2 values were greater than 0, indicating the predictive relevance of the factors (i.e. attitude toward the environment, subjective norms and perceived behavior control) on the recycling intention and recycling behavior among the informal micro-entrepreneurs in Kelantan, Malaysia.

Hypotheses	β	CI – Min.	CI – Max.	Sig.	Decision	r^2	Q^2	f^2
H1a: EA → AE	0.268	0.146	0.430	0.010	Supported	0.072	0.022	0.077
H1b: AE → RI	0.120	0.029	0.227	0.025	Supported	0.328	0.152	0.020
H2: SN → RI	0.118	-0.011	0.250	0.066	Not supported			0.013
H3: PC → RI	0.453	0.328	0.581	0.000	Supported			0.197
H4: RI → RB	0.697	0.616	0.767	0.000	Supported	0.486	0.237	0.945
Mediating effect of intention	β	CI – Min.	CI – Max.	Sig.	Decision			
H5a: AE → RI → RB	0.084	0.013	0.150	0.026	Mediation			
H5b: SN → RI → RB	0.082	-0.015	0.175	0.082	Not applicable			
H5c: PC → RI → RB	0.316	0.209	0.422	0.000	Mediation			

Notes: EA, environmental awareness; AE, attitude toward environment; SN, subjective norms; PC, perceived behavioral control; RI, recycling intention; RB, recycling behavior; CI, confidence interval

Source: Authors own compilation

Table IV.
Path analysis

As for the mediating effect of recycling intention, this study found that the indirect effect of attitude toward the environment on recycling behavior was statistically significant (p -value < 0.05), which indicates a significant mediation by recycling intention. Similarly, the significant (p -value < 0.05) indirect effect of perceived behavioral control on recycling behavior confirmed the significant mediating effect of recycling intention among the sample group.

4.3 Multi-group analysis

To provide an in-depth understanding from both theoretical and practical perspectives, this study compared the model using a multi-group analysis (PLS-MGA) approach. Among the antecedents and background of the study (as noted in Table I), this study selected subgroups of gender and level of education. However, the limited number of cases in the subgroups created a singular matrix error; therefore, only subgroups without a singular matrix error were considered for the PLS-MGA. The findings showed that the effect of “attitude toward the environment on recycling intention” was the only variable that differed significantly across subgroups of gender (male vs female) and education (SPM vs degree). The path coefficient for “attitude toward the environment on recycling intention” among the male informal micro-entrepreneurs was significantly (at the 5 percent level of significance) higher than that of females. Similarly, in the education context, the path coefficient for “attitude toward environment on recycling intention” differed significantly (at the 5 percent level of significance) among the respondents, which indicated that the relationship was significantly stronger for the respondents who reported SPM as their highest level of education (Table V).

	Gender (p -value)	SPM vs diploma (p -value)	SPM vs degree (p -value)	SPM vs others (p -value)	Diploma vs others (p -value)
EA → AE	0.484	0.200	0.708	0.828	0.950
AE → RI	0.036	0.782	0.026	0.892	0.417
SN → RI	0.427	0.684	0.995	0.511	0.251
PC → RI	0.484	0.206	0.084	0.206	0.497
RI → RB	0.938	0.761	0.717	0.202	0.753

Notes: EA, environmental awareness; AE, attitude toward environment; SN, subjective norms; PC, perceived behavioral control; RI, recycling intention; RB, recycling behavior

Source: Authors own compilation

Table V.
Multi-group analysis

4.4 Importance–performance matrix analysis

To further examine the results, the present study considered a *post hoc* importance–performance matrix analysis using environmental awareness, attitude toward the environment, subjective norms, perceived behavioral control and recycling intention as variables and recycling behavior as the target construct. Based on Table VI, it can be observed that recycling intention was the most important factor in determining recycling behavior, as reflected by its highest importance and relatively high performance values. Next came perceived behavioral control, with a high importance value but slightly lower performance values. Third was attitude toward the environment, with relatively high importance and performance values. Possessing the highest performance value but lowest importance scores, environmental awareness established that the construct was not significant in predicting recycling behavior. Finally, subjective norms also displayed significance in predicting perceived behavior among informal micro-entrepreneurs in Kelantan, Malaysia by means of intermediate importance and performance values.

5. Discussion

This study showed that environmental awareness has a significant and positive effect on attitudes toward the environment among informal micro-entrepreneurs in Kelantan, Malaysia (*H1a*). This finding is in line with Ramayah *et al.* (2012), indicating that the micro-entrepreneurs’ awareness of how their actions affect their surrounding environment influences their recycling intentions and behaviors. Attitudes toward the environment were also proved to have a significant and positive effect on recycling intention among the study sample (*H1b*). This finding supports Chan (1998), who indicated that micro-entrepreneurs do or do not recycle based on their personal attitude toward the environment. Perceived behavioral control was also found to have a positive and significant effect on the recycling intentions of the respondents; thus, *H3* was also supported. This finding agrees with Sidique, Joshi and Lupi (2010) and Sidique, Lupi and Joshi (2010) who portrayed micro-entrepreneurs as considering the easiness, availability of required resources and infrastructure when adopting and practicing recycling behavior. In fact, referring to Table VI, where perceived behavioral control is observed as the strongest predictor of recycling behavior after intention, it could be asserted that recycling facilities play a significant and major role in the adoption of recycling behaviors by micro-entrepreneurs.

Recycling intention also exhibited a significant and positive effect on recycling behavior among the sample (*H4*), which means that intentions remain a significant predictor of actual behavior, thus conforming to Ajzen (1991). This finding indicates that micro-entrepreneurs not only intend to recycle but are actually adopting recycling behavior. However, despite the positive effect identified among the respondents, the effect of subjective norms on recycling intention was not found to be statistically significant (*H2*). This finding differs from Ramayah *et al.* (2012), indicating that even in a collectivistic society, the influence of attitudes and perceived behavioral control on recycling intention and behavior is overwhelming, whereas social norms play only a secondary role. The findings on the mediating effect of recycling intention (*H5a–H5c*) on the relationships between attitude

Target construct Variables	Recycling behavior	
	Total effect	Performance
Environmental awareness	0.022	78.913
Attitude toward environment	0.084	78.150
Subjective norms	0.082	71.595
Perceived behavioral control	0.316	72.345
Recycling intention	0.697	75.258

Source: Authors own compilation

Table VI.
Performance and
total effects

toward the environment and perceived behavioral control with recycling behavior were found to be statistically significant, which indicates that recycling intention acts as a bridge and is significantly responsible for the effect of attitudes toward the environment and perceived behavioral control on recycling intention among the respondents of this study.

6. Policy implications and conclusion

We are faced with the reality of global environmental deterioration, and recycling constitutes a method for minimizing waste effectively and reducing the consumption of natural resources and energy (Chan and Bishop, 2013). In particular, in a rapidly developing economy such as Malaysia, with a relatively low recycling rate (Mahmud and Osman, 2010), there remains a significant need to encourage people to recycle. Against such a backdrop, this study examined the recycling intentions and behaviors of micro-entrepreneurs in Kelantan, Malaysia, under the premises of the TPB.

The findings of this study contribute to the existing literature in several ways. First, they provide empirical evidence that confirms the TPB's utility. This study extended the model of the TPB by explaining the effect of environmental awareness on attitudes toward the environment under its scope. It further refined the theory by examining the effect of attitudes toward the environment, subjective norms and perceived behavior control on recycling intentions and behaviors among micro-entrepreneurs in Kelantan, Malaysia within the frame of the TPB. Finally, the study addressed the paucity of studies focusing on recycling intention and behavior among entrepreneurs, particularly in the Malaysian context.

In terms of their practical implications, the results of this study could guide both the government and other developmental organizations in formulating appropriate policies and programs related to recycling, particularly among micro-entrepreneurs, as they cater to larger communities in developing nations. It is recommended that both public and private entities make collaborative efforts to inform and aware residents, with an added emphasis on females and higher-educated adults (refer to Table V), about the benefits of recycling by means of advertising campaigns or seminars that should, in turn, create a positive recycling attitude among individuals and trigger recycling behavior. Moreover, the respective authorities should also ensure the availability of appropriate facilities, such as infrastructure, resources, incentives and recycling accessibility, which should enhance recycling behavior among the citizens of the country.

As for the limitations, it is acknowledged that this study could not accommodate all of the antecedents of the constructs that could have influenced recycling intention. Moreover, this study collected data only from micro-entrepreneurs working in the informal sector of Kelantan, Malaysia, which could also limit the generalizability of the findings. Future researchers could use this study to understand the determinants of recycling intentions and behaviors, particularly among micro-entrepreneurs in Malaysia, and thereby could attempt to improve the model of this study or implement the existing model among different economic groups or socio-cultural settings to reveal a deeper and more generalized understanding of the adoption of and practices related to recycling behavior.

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