

Determinants of Sustainable E-Waste Disposal Behaviour among Malaysian Consumers: An Extended Theory of Planned Behaviour Approach

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ABSTRACT

The accelerated consumption of electrical and electronic equipment has resulted in a significant increase in electronic waste (e-waste), creating substantial environmental and public health challenges globally. In Malaysia, although formal e-waste management systems and regulations are in place, consumer participation in sustainable e-waste disposal remains relatively low. This study aims to investigate the determinants of sustainable e-waste disposal behaviour among Malaysian consumers by employing an extended Theory of Planned Behaviour (TPB) framework. In addition to the core TPB constructs, attitude, subjective norm, and perceived behavioural control, this study incorporates environmental knowledge, environmental concern, and government policy support to enhance the explanatory power of the model. A quantitative, cross-sectional survey was conducted among Malaysian consumers, and the data were analysed using partial least squares structural equation modelling (PLS-SEM). The findings are expected to provide empirical insights into the psychological and contextual factors influencing sustainable e-waste disposal behaviour, offering valuable implications for policymakers, environmental agencies, and practitioners in strengthening Malaysia's e-waste management initiatives.

Keywords: Electronic waste, sustainable disposal, theory of planned behaviour, environmental concern, Malaysia

INTRODUCTION

The rapid advancement of technology and increasing affordability of electronic devices have significantly shortened the lifespan of electrical and electronic equipment. As a result, electronic waste (e-waste) has become one of the fastest-growing waste streams worldwide (Aboelmaged, 2021; Idowu et al., 2022). E-waste contains valuable materials such as gold and copper, alongside hazardous substances including lead, mercury, and brominated flame retardants, which pose serious environmental and health risks if not managed properly (Shevchenko et al., 2020).

In Malaysia, the Department of Environment (DOE) regulates e-waste management primarily under the Environmental Quality Act 1974. While industrial e-waste is relatively well regulated, household e-waste management remains a major challenge due to limited public awareness, inadequate collection infrastructure, and weak enforcement mechanisms (Mohamad et al., 2022; Nik Mohd Munir et al., 2023). Many consumers tend to store obsolete electronic devices at home or dispose of them through informal channels, thereby undermining national sustainability efforts.

Previous studies suggest that technical solutions alone are insufficient to address the e-waste problem, highlighting the importance of understanding consumer behaviour (Corsini et al., 2019). Sustainable e-waste management requires active consumer participation, making behavioural studies crucial for designing effective policies and interventions. Among various behavioural theories, the Theory of Planned Behaviour (TPB) has

been widely applied to explain environmentally responsible behaviours, including recycling and waste segregation (Ajzen, 1991; Bamberg & Möser, 2007).

However, scholars have argued that the traditional TPB framework may not fully capture the complexity of e-waste disposal behaviour, particularly in developing economies where structural and institutional factors play a significant role (Aboelmaged, 2021; Mohamad et al., 2022). Consequently, this study extends the TPB framework by incorporating environmental knowledge, environmental concern, and government policy support to provide a more comprehensive understanding of sustainable e-waste disposal behaviour among Malaysian consumers.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) posits that human behaviour is primarily driven by behavioural intention, which is influenced by attitude, subjective norm, and perceived behavioural control (Ajzen, 1991). Attitude reflects an individual's evaluation of a behaviour, subjective norm represents perceived social pressure, and perceived behavioural control refers to the perceived ease or difficulty of performing the behaviour. TPB has demonstrated strong predictive power across various environmental and recycling contexts (Armitage & Conner, 2001).

Meta-analytical studies have confirmed the robustness of TPB in explaining pro-environmental behaviour, particularly when contextual variables are incorporated (Bamberg & Möser, 2007). In the context of e-waste disposal, TPB provides a useful theoretical foundation to examine consumers' psychological determinants while allowing extensions to improve explanatory power.

Attitude and Intention

Attitude refers to an individual's positive or negative evaluation of performing a particular behaviour. Prior research consistently indicates that favourable attitudes towards environmental protection lead to stronger intentions to engage in sustainable practices, including e-waste recycling and disposal (Aboelmaged, 2021; Kassim et al., 2023).

Consumers who perceive sustainable e-waste disposal as beneficial to the environment and society are more likely to develop positive behavioural intentions. Empirical studies in Malaysia and other developing countries have confirmed the significant role of attitude in predicting recycling intention (Mohamad et al., 2022).

H1: Attitude positively influences consumers' intention to dispose of e-waste sustainably.

Subjective Norm and Intention

Subjective norm captures the influence of social pressure from family members, peers, and society. In collectivist cultures such as Malaysia, social norms play a crucial role in shaping individual behaviour (Schultz et al., 2007).

Previous studies have found that encouragement from significant others and perceived societal expectations positively influence recycling and environmentally responsible behaviours (Nguyen et al., 2019; Jamil et al., 2023). Therefore, subjective norm is expected to exert a positive influence on consumers' intention to dispose of e-waste sustainably.

H2: Subjective norm positively influences consumers' intention to dispose of e-waste sustainably.

Perceived Behavioural Control and Intention

Perceived behavioural control (PBC) reflects individuals' perception of their ability to perform a behaviour, considering both internal and external constraints. Accessibility to collection points, availability of information, and convenience are key factors influencing PBC in e-waste disposal (Idowu et al., 2022).

Studies have shown that higher perceived behavioural control significantly enhances recycling intention and behaviour (Tonglet et al., 2004; Shevchenko et al., 2020).

H3: Perceived behavioural control positively influences consumers' intention to dispose of e-waste sustainably.

Environmental Knowledge and Attitude

Environmental knowledge refers to an individual's understanding of environmental issues and the consequences of unsustainable practices. Knowledgeable consumers are more likely to recognise the hazards associated with improper e-waste disposal and develop favourable attitudes towards sustainable disposal methods (Kaiser et al., 2010).

Empirical evidence suggests that environmental knowledge indirectly influences behavioural intention through attitude formation (Bamberg, 2003; Shevchenko et al., 2020).

H4: Environmental knowledge positively influences attitude towards sustainable e-waste disposal.

Environmental Concern and Attitude

Environmental concern reflects the degree to which individuals are emotionally involved and concerned about environmental degradation. High levels of environmental concern have been associated with stronger pro-environmental attitudes and intentions (Stern, 2000; Schultz, 2014).

In the context of e-waste, environmentally concerned consumers are more likely to support sustainable disposal practices to mitigate environmental harm.

H5: Environmental concern positively influences attitude towards sustainable e-waste disposal.

Government Policy Support and Perceived Behavioural Control

Government policy support includes regulatory frameworks, public awareness campaigns, and availability of formal e-waste collection infrastructure. Institutional support plays a crucial role in facilitating sustainable consumer behaviour by reducing perceived barriers (Saphores et al., 2012).

Studies indicate that effective policy support enhances consumers' perceived behavioural control, thereby increasing their intention to engage in sustainable disposal practices (Islam et al., 2016).

H6: Government policy support positively influences perceived behavioural control.

METHODOLOGY

Research Design

This study employs a quantitative, cross-sectional research design to test the proposed hypotheses. A structured questionnaire was developed based on validated measurement scales from previous studies.

Sampling and Data Collection

The target population comprises Malaysian consumers aged 18 years and above. Data were collected using both online and offline survey methods. A minimum sample size of 300 respondents was targeted, consistent with PLS-SEM requirements (Hair et al., 2019).

Measurement Instruments

The measurement items were modified to suit the context of sustainable e-waste disposal behaviour among Malaysian consumers. A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to measure respondents' agreement level. Table X summarises the measurement items used in this study.

Construct	Code	Measurement Items	Source
Attitude (ATT)	ATT1	Disposing e-waste through formal recycling channels is beneficial to the environment.	Aboelmaged (2021); Mohamad et al. (2022)
	ATT2	Sustainable e-waste disposal is a good practice.	Kassim et al. (2023)
	ATT3	I believe disposing e-waste properly is valuable for society.	Bamberg & Möser (2007)
	ATT4	Sustainable e-waste disposal is a wise decision.	Aboelmaged (2021)
Subjective Norm (SN)	SN1	People important to me think that I should dispose of e-waste sustainably.	Ajzen (1991); Nguyen et al. (2019)
	SN2	My family encourages me to dispose of e-waste properly.	Jamil et al. (2023)
	SN3	Society expects me to recycle electronic waste responsibly.	Schultz et al. (2007)
	SN4	I feel social pressure to dispose of e-waste sustainably.	Bamberg & Möser (2007)
Perceived Behavioural Control (PBC)	PBC1	I have the ability to dispose of e-waste sustainably.	Ajzen (1991); Tonglet et al. (2004)
	PBC2	It is easy for me to access e-waste recycling facilities.	Idowu et al. (2022)
	PBC3	I have sufficient knowledge on how to dispose of e-waste properly.	Shevchenko et al. (2020)
	PBC4	Whether I dispose of e-waste sustainably is entirely under my control.	Aboelmaged (2021)
Environmental Knowledge (EK)	EK1	I understand the environmental hazards caused by improper e-waste disposal.	Kaiser et al. (2010)
	EK2	I am knowledgeable about proper e-waste recycling methods.	Bamberg (2003)
	EK3	I am aware of government initiatives related to e-waste management.	Mohamad et al. (2022)
	EK4	I understand the environmental benefits of sustainable e-waste disposal.	Shevchenko et al. (2020)
Environmental Concern	EC1	I am concerned about environmental pollution caused by e-waste.	Stern (2000); Schultz (2014)

(EC)	EC2	Environmental protection is important to me.	Dunlap et al. (2000)
	EC3	I feel responsible for protecting the environment.	Wang et al. (2018)
	EC4	I worry about the negative impacts of electronic waste on future generations.	Schultz et al. (2011)
Government Policy Support (GPS)	GPS1	Government provides adequate facilities for e-waste recycling.	Saphores et al. (2012)
	GPS2	Government policies encourage consumers to recycle e-waste.	Islam et al. (2016)
	GPS3	Government campaigns increase awareness of e-waste management.	Mohamad et al. (2022)
	GPS4	Government enforcement motivates consumers to dispose of e-waste properly.	Idowu et al. (2022)
Behavioural Intention (BI)	BI1	I intend to dispose of my e-waste through formal recycling channels.	Ajzen (1991); Aboelmaged (2021)
	BI2	I plan to recycle my electronic waste in the future.	Mohamad et al. (2022)
	BI3	I am willing to participate in e-waste recycling programmes.	Kassim et al. (2023)
	BI4	I will make an effort to dispose of e-waste sustainably.	Bamberg & Möser (2007)
Sustainable E-Waste Disposal Behaviour (BEH)	BEH1	I have disposed of e-waste through formal recycling channels before.	Aboelmaged (2021)
	BEH2	I regularly separate electronic waste from general household waste.	Corsini et al. (2019)
	BEH3	I send obsolete electronic devices to authorised collectors.	Mohamad et al. (2022)
	BEH4	I actively participate in e-waste recycling activities.	Shevchenko et al. (2020)

Table 1. Measurement Items for Construct (*The TPB extension is operationalised through EA, PC, and MO, each modelled as independent predictors of intention*)

All constructs were measured using reflective indicators adapted from established literature. Responses were captured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data Analysis

PLS-SEM was used to assess both the measurement and structural models. Reliability, convergent validity, discriminant validity, and hypothesis testing were conducted following recommended guidelines. All constructs in this study were measured using multi-item reflective scales adapted from established literature.

EXPECTED RESULTS AND DISCUSSION

The results are expected to demonstrate the significant influence of attitude, subjective norm, and perceived behavioural control on intention, consistent with TPB predictions. Environmental knowledge and environmental concern are anticipated to strengthen attitude, while government policy support is expected to enhance perceived behavioural control.

These findings would provide empirical support for extending TPB in the context of e-waste disposal in developing economies.

Practical Implications

- Policymakers should strengthen awareness campaigns to enhance environmental knowledge.
- Improved accessibility to e-waste collection facilities can increase perceived behavioural control.
- Social influence strategies can be leveraged to promote sustainable norms.

CONCLUSION

This study extends the Theory of Planned Behaviour to examine sustainable e-waste disposal behaviour among Malaysian consumers. By incorporating environmental knowledge, environmental concern, and government policy support, the study provides a more comprehensive understanding of consumer behaviour in the Malaysian context.

LIMITATIONS AND FUTURE RESEARCH

The study is limited by its cross-sectional design and reliance on self-reported data. Future research may adopt longitudinal designs or explore additional variables such as moral obligation and economic incentives.

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