

Assessing factors affecting students' E-waste recycling intention among households in Ho Chi Minh City, Vietnam

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Abstract: *Efforts to advance a circular economy and address the pressing issue of electronic waste (E-waste) have highlighted E-waste recycling as a valuable pathway, yielding a variety of valuable and essential materials. This study expands upon the Theory of Planned Behavior (TPB) by integrating two significant factors—Knowledge and Propaganda—to predict students' intentions to recycle E-waste in Ho Chi Minh City (HCMC), Vietnam. Students, pivotal in electronic consumption and waste generation, warrant a thorough examination of their recycling behaviors. Analyzing a sample of 374 HCMC students using SPSS 20.0, this research reveals the strongest impact is Knowledge ($\beta_4=0.326$), followed by Attitude ($\beta_1=0.223$), Subjective norm ($\beta_2=0.217$), Perceived behavioral control ($\beta_3=0.196$), and Propaganda ($\beta_5=0.082$). These findings are socially and practically meaningful, guiding the creation and implementation of policies for recycling E-waste. They underscore the significance of educational and awareness-raising initiatives on E-waste recycling. Moreover, propaganda, encompassing persuasive communication and advocacy, emerges as a potential catalyst in shaping positive attitudes and E-waste recycling intentions among youth. These insights are vital for shaping E-waste policies in HCMC and similar areas facing related issues. As environmental concerns linked to E-waste escalate, this study contributes significantly to promoting sustainable and responsible electronic consumption and disposal practices.*

Keywords: *E-waste; recycling intention; knowledge; propaganda; TPB*

1. Introduction

As quality of life improves and information technology advances, electronic and electrical devices have become integral to daily life, leading to a rise in E-waste. However, the current practices of producing, using, and disposing of this waste are unsustainable [1]. Approximately 50 million tons of E-waste are generated worldwide each year, with 75-80% being transported to Asia and African countries for recycling and disposal [2]. This trend has resulted in significant environmental and health risks in many nations, including Vietnam.

Within a circular economy, E-waste is considered an important source of recycled raw materials, helping to reduce dependence on the extraction of natural resources and promoting sustainability. Nonetheless, the rates of recycling remain notably low. In 2019, Vietnam produced 257,000 tons of E-waste from 514,000 tons of electronics, with television waste alone expected to reach 250,000 tons by 2025. These numbers highlight the urgent need for better recycling systems and sustainable waste management in Vietnam [1]. Vietnam's National Strategy on Green Growth for 2021-2030, aiming toward 2050, seeks to achieve 100% safe collection and treatment of solid waste. This strategy supports environmental sustainability, pollution reduction, and a shift to a circular economy, promoting public health, resource conservation, and ecological balance [3]. E-waste management in Vietnam faces challenges due to limited public awareness and reluctance to pay for proper disposal [4]. This research examines the factors affecting students' E-waste recycling intention, as they represent a significant group of electronic and electrical device users. A range of factors, such as psychological, social, and situational aspects, influence students' motivation to engage in E-waste recycling. Comprehending these elements is critical for developing targeted strategies that encourage environmentally responsible behavior among young consumers. By identifying

key motivators and challenges to E-waste recycling, the study aims to propose practical solutions to foster more sustainable habits and reduce E-waste pollution. Addressing this issue is not only crucial for environmental protection but also represents an urgent priority in minimizing the adverse effects on ecosystems and public health.

The TPB is a commonly applied model for examining recycling intentions, emphasizing the roles of attitude (AT), subjective norm (SN), and perceived behavioral control (PBC). Nguyen et al. investigated that these factors significantly influence E-waste recycling intentions, particularly in Vietnam [5]. Positive attitudes toward recycling, along with SN and PBC, have been identified by Kassim et al. as significant predictors in E-waste recycling intentions [6]. This aligns with findings from Xiang, who integrated TPB with the Value-Belief-Norm (VBN) model, identifying values and awareness of consequences as key factors influencing recycling intentions [7]. Additionally, the role of knowledge and awareness regarding E-waste recycling cannot be understated. Delcea et al. highlight that households frequently encounter difficulties in recycling due to insufficient knowledge of the E-waste management system [8]. Students' limited awareness of E-waste policies and collection programs, notably affects their willingness to pay for recycling [9]. Educational initiatives to improve knowledge about E-waste recycling are crucial for improving recycling intentions among students and their families. Studies also highlight that past experiences and recycling costs significantly influence household waste recycling behavior [10]. Although the TPB framework has been successful in studying behavior, further research on related influencers is needed. This research enhances the TPB by incorporating two additional factors - KN and PR to better predict students' intentions to recycle E-waste in HCMC, Vietnam. Gaining a deeper understanding of students' involvement in E-waste recycling intention.

2. Theoretical Basis and Research Hypotheses

2.1 Theory of Planned Behavior (TPB)

The TPB is a widely used socio-psychological model for predicting and explaining social behaviors, highlighting the influence of AT, SN, and PBC [11]. By extending the original TPB model, this paper modified with two additional factors, KN and PR, to examine the impact of collective beliefs and informational campaigns on students' E-waste recycling intentions.

2.2 Research Hypotheses

The extended theoretical model for household E-waste recycling intention is proposed, with its indicated hypotheses (Figure 1).

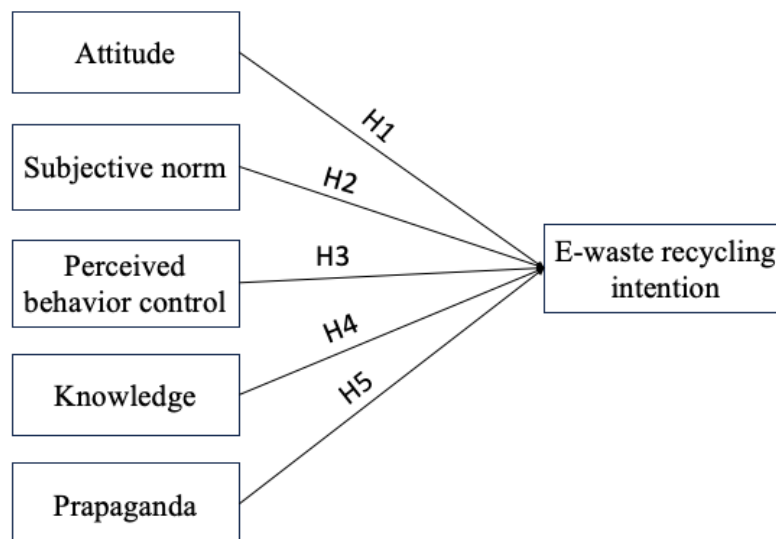


Fig. 1. Extended theoretical model

H1: AT has positively influence on E-waste recycling intention.

AT is defined as an individual's positive or negative reaction to a specific behavior [12]. In this study, attitude is described as individuals' impression and behavioral tendency toward E-waste recycling, reflecting their impressions and inclinations toward it.

H2: SB has positively influence on E-waste recycling intention.

Studies have shown that SN plays an essential influence in shaping individuals' intentions to participate in recycling activities [13]. SN involves the impact of external social influences on waste sorting goals, illustrating how others' views and behaviors affect a person's commitment to recycling.

H3: PBC has positively influence on E-waste recycling intention.

PBC refers to a person's belief regarding the simplicity or challenge of carrying out a specific behavior [13]. Having more resources and facing fewer barriers enhances their sense of control.

H4: KN has positively influence on E-waste recycling intention.

KN is defined as an understanding of recycling practices and principles. KN is a key factor influencing recycling behavior, with several studies showing a strong link between awareness of E-waste management and individual recycling activities [14].

H5: PR has positively influence on E-waste recycling intention.

PR promotes E-waste recycling by focusing on the environmental and health hazards of improper disposal. This increased understanding motivates individuals to participate in recycling initiatives. Through strategic messaging, propaganda fosters a sense of responsibility and community engagement, promoting more sustainable practices [15].

3. Methodology

3.1. Study Area

HCMC, as Vietnam's largest urban center and a major hub of education, technology, and commerce, presents a unique context for studying E-waste recycling behaviors, particularly among students. The city is home to a large and diverse population of students, with numerous universities, colleges, and vocational schools that draw individuals from across the country. Students in HCMC represent a key demographic in the consumption of electronic and electrical devices, making them significant contributors to E-waste generation.

3.2. Analysis methods

3.2.1 Sample size selection

Hair et al. [16] suggested in 2014 that an observation-to-measurement ratio of 5:1 is recommended. With 25 measurements in this study, a minimum sample size of $n=25 \times 5 = 125$ would be required. In order to obtain reliable results that accurately represent the general population, 400 questionnaires were distributed by face-to-face interviews, resulting in 374 valid responses after pre-processing. These 374 samples were subsequently analyzed and used for the survey in this study.

3.2.2 Measuring scale

The questionnaire was meticulously crafted to meet the research objectives and combined of two primary sections. The first section evaluates the research model, which was developed by conducting in-depth interviews with 30 students to identify factors affecting their E-waste recycling behavior. A 5-point Likert scale, from "strongly disagree" to "strongly agree," is used to capture participants' attitudes and reactions to various statements. In this section, the questionnaire had five conceptual factors: AT, SB, PBC, KN, PR, and E-waste recycling intention. The second section of the questionnaire collects demographic details such as Gender, School, Year of school, providing important context for analyzing the data. This integration of both qualitative and quantitative data facilitates a thorough understanding of the elements affecting students' E-waste recycling intention and ensures that the results are both insightful and practical for tackling E-waste issues. The questionnaire is divided into six conceptual sections, as outlined below:

Tab. 1. Measurement scale to analyze the intention of E-waste recycling.

Coding	Source
Attitude	
AT1	I feel pleased when I participate in E-waste recycling.
AT2	Recycling E-waste helps benefit society.
AT3	It is everyone's duty to recycle E-waste.
AT4	Recycling E-waste helps lower the costs of managing pollution.
AT5	Recycling E-waste sets an example for children.
AT6	Recycling E-waste can be sold to receive remuneration.
	[17]
Subjective norm	
SB1	I achieve in E-waste recycling because my family wants.
SB2	I achieve in E-waste recycling because my friends want.
SB3	I achieve in E-waste recycling because my neighbors want.
SB4	I achieve in E-waste recycling because the community wants.
	[17]
Perceived behavioral control	
PBC1	I am aware that E-waste can be recycled.
PBC2	I am knowledgeable about the process of E-waste recycling.
PBC3	I have effectively been able to recycle E-waste.
	[18]
Knowledge	
KN1	Recycling E-waste is a key method for safeguarding the environment.
KN2	Recycling E-waste is a crucial approach to preserving natural resources.
KN3	I understand how to recycle E-waste
	[19]
Propaganda	
PR1	Propaganda aids in improving the students' awareness about E-waste recycling.
PR2	Propaganda encourages E-waste recycling.
PR3	Propaganda positively influences an students' E-waste recycling intention.
	[19]
E-waste recycling intention	
RI1	I am happy to participate in the local E-waste recycling plan.
RI2	I am going to recycle E-waste as a habit.
RI3	I am ready to share with my relatives about E-waste recycling experiences.
RI4	I am glad to follow the community's guidance.
	[8]

3.3. Data analysis

Before examining the hypotheses, Conbach’s Alpha coefficient is utilized to evaluate the reliability of the scales and deduct inappropriate variables in the study progression [12]. The Corrected Item Total Correlation is accepted when it is positive and larger than 0.3. The scale reliability coefficient is accepted when Conbach’s Alpha is larger than 0.6.

After that, EFA is used to identify the relationship between measure variables. Variables with factor loading, which are not significant or less than 0.5 will be excluded to assure convergent validity. The KMO & Bartlett's Test of Sphericity is used to consider satisfaction which is a very significant aspect of factor analysis. The KMO index requires fulfilling the condition $0.6 \leq KMO \leq 1$. The Eigenvalue index must be larger than 1 to be retained [20].

The research builds and performs a linear regression model as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_{k1} \quad (1)$$

Where: Y – the dependent variable;

$\beta_0, \beta_1, \beta_2, \beta_3,$ and β_k - standard Beta coefficients;

X_1, X_2, X_3, X_k – independent variable.

4. Results

4.1. Descriptive statistics

Tab. 2. Socio-demographic characteristics (n=374)

Demographic Variables	Group	Frequency	Percentage (%)
Gender	Female	177	47.3
	Male	197	52.7
Year of Study	1 st year	113	30.2
	2 nd year	73	19.5
	3 rd year	96	25.7
	4 th year	92	24.6
School	HCMUS	110	29.4
	HCMURE	83	22.2
	TDTU	95	25.4
	UEH	86	23.0

The descriptive statistical results of the sample are presented in Table 2. The survey sample size at the HCMUS accounts for the highest proportion (29.4%), followed by the HCMURE (22.22%), TDTU (25.4%), and UEH (23%). The gender distribution of the sample is relatively balanced, with males accounting for 52.7% and females 47.3%. The sample distribution by academic year is as follows: first, second, third, and fourth-year students are 30.2%, 19.5%, 25.7%, and 24.6%, respectively.

4.2. Testing for reliability of the scales

Table 3 shows the results of the Cronbach’s Alpha coefficient test on the scales. The evaluation result illustrates that all Cronbach's Alpha coefficients of scales are higher than 0.6 (the minimum is 0.803), and the items are also higher than 0.3 (the minimum is 0.481). Therefore, all measurement items could be evaluated using the Exploratory Factor Analysis (EFA) method.

In the first round of the EFA method, 19 independent variables were examined. Items AT6 (Recycling E-waste can be sold for remuneration), PBC1 (I know what E-waste can be recycled), and PR3 (Propaganda positively influences E-waste recycling intention) were deleted due to isolation. After performing EFA for

the fourth time, 16 independent variables remained. The KMO index was 0.886, and Bartlett's test yielded a result of 4914.836 (Sig. = 0.000), indicating good correlations among the variables. The Eigenvalue ranged from 1.101 to 7.887, with factor loadings between 0.740 and 0.928. The highest cumulative coefficient was 86.024%, confirming that the retained variables are ideal and the EFA model is appropriate.

EFA analysis of E-waste recycling intention was performed with four observed items. Table 5 shows that with the Varimax rotation of the PCA method. There is an extracted component, the Eigenvalue is 3.070, the KMO index reached 0.828 and Barlett's test of sphericity achieved a high significance value (Sig. = 0.000). Four-factor loadings rank from 0.844 to 0.916. In conclusion, the scaling task is satisfactory; four items that are used to measure E-waste recycling intention are accepted and used in further analysis.

Tab. 3. Results of Cronbach's Alpha scale

Observed variables	Scale average if variable deleted	Scale variance if variable deleted	Corrected Total Correlation	item- Cronbach's Alpha if Item Deleted
Attitude towards E-waste recycling – Cronbach's Alpha = 0.903				
AT1	21,17	16.410	0.797	0.876
AT2	20.86	17.248	0.774	0.882
AT3	21.14	16.150	0.782	0.878
AT4	21.01	16.611	0.796	0.877
AT5	21.02	16.423	0.805	0.875
AT6	21.73	16.470	0.543	0.924
Subjective norm toward E-waste recycling- Cronbach's Alpha = 0.897				
SB1	8.28	3.289	0.797	0.854
SB2	8.41	3.100	0.820	0.836
SB3	8.23	3.588	0.782	0.869
Perceived behavioral control toward E-waste recycling - Cronbach's Alpha = 0.810				
PBC1	6.44	5.186	0.546	0.849
PBC2	7.36	3.769	0.717	0.678
PBC3	7.23	3.543	0.745	0.647
Knowledge toward E-waste recycling - Cronbach's Alpha = 0.929				
KN1	8.22	3.585	0.834	0.913
KN2	8.27	3.501	0.876	0.880
KN3	8.29	3.514	0.853	0.898
Propaganda toward E-waste recycling - Cronbach's Alpha = 0.803				
PR1	10.95	8.957	0.561	0.783
PR2	11.04	8.661	0.592	0.769
PR3	11.99	6.679	0.710	0.706
E-waste recycling Intention - Cronbach's Alpha = 0.902				
RI1	11.35	3.755	0.534	0.786

RI2	11.46	3.270	0.647	0.733
RI3	11.68	3.103	0.656	0.727
RI4	11.86	3.058	0.624	0.746

Tab. 4. Results EFA method for independent variables

Observed variables	Factor loading				
	1	2	3	4	5
AT2	0.844				
AT5	0.830				
AT4	0.809				
AT3	0.796				
AT1	0.759				
SB2		0.827			
SB1		0.824			
SB3		0.817			
KN2			0.876		
KN1			0.842		
KN3			0.740		
PR2				0.928	
PR1				0.924	
PBC3					0.895
PBC2					0.881
Eigenvalue	7.887	1.653	1.320	1.032	1.011
Cumulative %	52.581	63.603	72.404	79.285	86.024

Tab. 5. Results of the EFA method for the dependent variable

Component Matrix	Factor loading
RI1	0.858
RI2	0.844
RI3	0.916
RI4	0.885
Eigenvalue	3.070
Cumulative %	76.747

4.3. Linear regression analysis

4.3.1 Spearman's Correlation Analysis

Table 6 shows the correlation matrix for all study variables. The Spearman correlation index ranges from 0.157 to 0.707, Sig. < 0.01. This finding suggests a significant relationship between the independent and dependent variables. The E-waste recycling intention (RI) scale has the highest correlation with $r = 0.707$.

Tab. 6. Correlation matrix for all study variables

Variable	AI	KN	PBC	PR	RI	SB
AI	1	0.603**	0.385**	0.434**	0.667**	0.657**
KN		1	0.460**	0.380**	0.707**	0.593**
PBC			1	0.157**	0.548**	0.432**
PR				1	0.405**	0.352**
RI					1	0.656**
SB						1

Note: ** Sig. < 0.01 level (2-tailed)

4.3.2 Regression analysis

Table 7 presents the regression model results. The VIF indexes range from 1.277 to 2.130 (<10), and Tolerance indicators range from 0.470 to 0.783 (>0.1), indicating low multicollinearity among variables. The adjusted R^2 is 0.659, meaning the independent variables predict 65.9% of the variance in the dependent variable. The F value is 142.441 with a significance of 0.000 ($p < 0.001$), confirming the model's appropriateness for the data. Six independent factors significantly influence waste separation intention ($p < 0.05$). The strongest impact is Knowledge ($\beta_4 = 0.326$), followed by Attitude ($\beta_1 = 0.223$), Subjective norm ($\beta_2 = 0.196$), Perceived behavioral control ($\beta_3 = 0.217$), and Propaganda ($\beta_5 = 0.082$). In the normalized regression equation, the β coefficients are determined as follows: (1) $\beta_1 = 0.223$ indicates that, with other factors held constant, a 1-unit increase in the attitude factor (AT) leads to a 0.223-unit rise in the expected value of E-waste recycling intention among households in HCMC; (2) $\beta_2 = 0.196$ demonstrates that, with other factors constant, a 1-unit rise in subjective norm (SN) boosts the expected value of E-waste recycling intention by 0.196 units; (3) $\beta_3 = 0.217$ shows that, with other factors constant, a 1-unit increase in perceived behavioral control (PBC) results in a 0.217-unit increase in the expected value of E-waste recycling intention; (4) $\beta_4 = 0.326$ signifies that, assuming other factors remain unchanged, a 1-unit increase in knowledge (KN) raises the expected value of E-waste recycling intention by 0.326 units; (5) $\beta_5 = 0.082$ reflects that, when other factors are unchanged, a 1-unit increase in propaganda (PR) enhances the expected value of E-waste recycling intention by 0.082 units.

Tab. 7. Regression model's results

Model	Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
AT	0.222	0.044	0.223	5.017	0.000	0.470	2.130
SB	0.173	0.038	0.196	4.532	0.000	0.493	2.028
PBC	0.166	0.027	0.217	6.149	0.000	0.746	1.340
KN	0.294	0.038	0.326	7.717	0.000	0.520	1.923
PR	0.067	0.028	0.082	2.371	0.018	0.783	1.277

Adjusted $R^2 = 0.659$

F value = 142.441

F sig. = 0.000

Thus, the regression model is deemed suitable for predicting the relationship between the independent and dependent variables. The linear regression model is examined using the following formula:

Unstandardized regression equation has the form:

$$Y = 0.222 * AT + 0.173 * SB + 0.166 * PBC + 0.294 * KN + 0.067 * PR \quad (3)$$

The standardized regression has the form:

$$Y = 0.223 * AT + 0.196 * SB + 0.217 * PBC + 0.326 * KN + 0.082 * PR \quad (4)$$

The research was conducted to identify and evaluate the factors influencing students' intentions toward E-waste recycling in HCMC. The results of the regression analysis highlighted that three out of the five independent variables: AT, SB, PBC, KN, and PR significantly impacted students' intentions to engage in E-waste recycling. Additionally, the findings revealed that individuals' intentions to sort waste were relatively high, with scores ranging from 3.74 to 4.13 on the Likert scale. This result suggests that while students are aware of E-waste recycling models, these initiatives have yet to be fully implemented in the local area, limiting opportunities for practical application.

5. Discussion

Expanding the TPB model with two additional factors: Knowledge and Propaganda aims to elucidate the factors influencing students' E-waste recycling intention. The research results support all the proposed hypotheses, thereby contributing significantly to both academic and practical domains.

The study highlights that students' attitude toward E-waste recycling has the greatest influence on their recycling behaviors. As a result, it is essential to launch educational initiatives aimed at raising public awareness and promoting positive perceptions of the benefits of E-waste recycling. These initiatives are crucial in communicating the advantages of E-waste recycling, particularly its role in conserving natural resources and reducing environmental harm by decreasing landfill use and lowering greenhouse gas emissions. The recognition of the inherent benefits of E-waste recycling is pivotal in motivating students to actively engage in sorting household waste, thereby cultivating and reinforcing such environmentally responsible habits among the community. As a result, the study advocates for strategic educational initiatives that not only inform but also inspire students to participate in E-waste recycling practices, thereby contributing to a more sustainable and environmentally conscious society in HCMC. The findings also offer valuable insights for policymakers, suggesting the adoption of successful household waste separation models from other countries to formulate valuable laws and regulations for addressing E-waste recycling challenges.

Furthermore, the study's results emphasize that propaganda is the positive factor influencing students' E-waste recycling intention. These underscores note that individuals actively engaging in waste separation do so primarily because they admit it as a cost-effective means to improve environmental quality and bolster socio-economic sustainability. Additionally, recognizing the importance of social pressure in shaping residents' intentions toward E-waste recycling, strategic public media and communication campaigns should be thoughtfully crafted. The goal is to attract an increasing number of individuals to adopt E-waste recycling behaviors, fostering a community-wide commitment to sustainable waste management practices.

In addition, this paper serves as a pioneering source of information with potential implications for planning and bolstering international collaboration in addressing E-waste issues for the global community. By advancing our understanding of students' intentions and behaviors related to waste separation and recycling, this research contributes to the collective efforts aimed at fostering sustainable and environmentally conscious practices on an international scale. The suggested solution serves as a strategic measure to curtail the volume of waste directed to landfills. It proposes the interception and conversion of a significant portion of waste into energy and compost. Effective source separation methods are integral to the plan, facilitating the collection of recyclable fractions. This approach not only contributes to waste reduction but also fosters community participation.

While numerous studies have explored E-waste recycling intention using the TPB model [5-10], in this research, by incorporating Knowledge and Propaganda into the modified TPB framework provides a more comprehensive understanding of the factors influencing E-waste recycling behaviors. This study explores the factors influencing students' intentions to recycle E-waste, as they form a significant demographic of electronic and electrical device users. Various psychological, social, and situational factors impact their willingness to participate in E-waste recycling. Understanding these factors is essential for designing effective strategies to promote environmentally responsible behaviors among younger consumers. By pinpointing the main motivators and obstacles to E-waste recycling, the research seeks to recommend practical approaches to encourage sustainable practices and minimize E-waste pollution. The proposal advocates for the implementation of incentive schemes such as shared-income models, tax reductions, or award systems. These incentives are designed to ensure the sustained success of the project while encouraging active participation from the community. By incorporating these measures, the proposed zero-waste management system aims to create a harmonious balance between environmental conservation, social engagement, and economic viability in HCMC. Nevertheless, the effectiveness of the proposed solution hinges on a concerted effort by government policies to prioritize sustainable waste management. The HCMC government should enact policies that actively promote and incentivize recycling activities. Considerable financial support should be allocated to the recycling sector, facilitating the enhancement of existing recycling facilities or enabling investments in new facilities equipped with advanced technologies.

6. Conclusion

This study explores the factors that influence college students' intentions to recycle E-waste in HCMC, expanding the TPB by incorporating additional variables: Knowledge and Propaganda. Students, as key contributors to electronic consumption and waste generation, deserve a detailed analysis of their recycling behaviors. Through an examination of a sample of 374 students from HCMC using SPSS 20.0, this study identifies the strongest impact is Knowledge ($\beta_4=0.326$), followed by Attitude ($\beta_1=0.223$), Subjective norm ($\beta_2=0.217$), Perceived behavioral control ($\beta_4=0.196$), and Propaganda ($\beta_5=0.082$). These findings hold both social and practical significance, offering valuable guidance for developing and implementing policies to promote E-waste recycling. They highlight the importance of educational programs and awareness campaigns aimed at encouraging E-waste recycling practices. Additionally, persuasive communication and advocacy efforts stand out as effective tools for fostering positive attitudes and intentions toward E-waste recycling among young people. These insights are essential for shaping E-waste management strategies, not only in HCMC but also in other regions facing similar E-waste challenges. The results reveal that several factors positively impact students' intentions to engage in E-waste recycling. Among these, Knowledge stands out as the most influential factor, suggesting that well-informed students are more likely to participate in E-waste recycling. Consequently, educational campaigns that utilize public media and various communication platforms play a vital role in encouraging recycling behaviors among young people. However, the study has certain limitations. Firstly, it focuses exclusively on college students in HCMC, limiting the extent to which these findings can be generalized to other groups or regions. Future research should aim to include a more diverse and representative sample to enhance generalizability. Secondly, consistent with the original TPB framework, this study considers only two latent variables: Knowledge and Propaganda. Future studies should examine additional variables, including aspects related to management, policy, and household waste separation practices, to gain a more comprehensive understanding of the factors that drive E-waste recycling intentions.

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