

Analysis of E-Waste Recycling Intention in Ho Chi Minh City, Vietnam

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ABSTRACT

Due to the increased demand for electrical and electronic devices, Vietnam has emerged as one of the major importers of electronic goods in Southeast Asia. This corresponds to Vietnam facing an escalating issue of electronic waste. In light of this concern, the purpose of this study was to investigate the individual intention regarding the recycling of electronic waste. To achieve this objective, a survey was conducted among 1020 respondents with varying genders, and educational levels in Ho Chi Minh City. The collected data was analyzed using SPSS and AMOS software, enabling the development of a structural model. The findings of the study found that social pressure was the most influential factor affecting the intention to recycle electronic waste. Following closely behind were inconveniences, economic factors, attitudes, and awareness. Based on the outcome, it is recommended that policymakers should focus on creating effective advocacy programs, enhancing convenience, and improving public understanding and awareness in order to help reduce electronic waste.

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1. Introduction

In recent decades, the production of electronic equipment has experienced a significant surge, primarily driven by the growing demand of customers and fierce competition within the electronic market. The global amount of electrical and electronic equipment on the market rose dramatically 96 billion kg in 2022 and it is projected to increase to 120 billion kg by 2030 [1]. As a result, this contributes to the exponential rise of global electronic waste. Electronic waste (e-waste) refers to the end-of-life electrical and electronic equipment (EEE) that is disposed of and no longer functioning [2]. Despite the increasing amount of e-waste which is predicted to rise to 82 billion kg by the year 2030, many countries have documented low e-waste recycling rate, particularly in Africa and Asia, at 0.7% and 11.8% respectively [1]. This alarming trend highlights the urgent need for effective waste management strategies and sustainable practices to address the e-waste crisis.

Located in Asia, Vietnam has experienced the same trend on e-waste issue. In Vietnam, the demand for electrical and electronic equipment (EEE) continues to grow annually [3], [4]. Numerous manufacturers and retailers in the country opt to adopt price-based strategies with discounts ranging from 10-20%, making electric and electronic devices increasingly affordable for customers across all income segments, even low-income individuals residing in rural areas [5]. Nevertheless, despite this positive aspect, there are significant challenges due to the insufficient formal collection and recycling systems and the absence of mandatory regulations on e-waste management for individuals. E-waste in Vietnam originates from various primary sources including disposal from domestic EEE consumption, illegal importation of EEE, and used EEE [6]. Based on Articles 54 and 55 of the Environmental Protection Law No. 72/2020/QH14 dated November 17, 2020, regulations have been established concerning the environmental protection obligations of production, business, and service establishments and the responsibilities of organizations and individuals in collecting and treating waste produced and imported. According to this law, the import of electronic waste is strictly prohibited; however, such activities still occur illegally. The complex structure has posed challenges to electronic waste management and has placed unseen pressure on the local electronic waste recycling sector.

In contrast to the growth of the consumer electronics and electronics industry, the field of e-waste recycling as well as research on e-waste recycling behavior of individuals in Vietnam, particularly in Ho Chi Minh city is relatively new and emerging [7], [8]. Therefore, it is crucial to analyze individual recycling intention to propose relevant strategies and sustainable solutions for organizations and companies, especially for those looking to enter this emerging sector. The objective of this study is to examine the characteristics of recycling intention and identify factors that influence individual intention towards e-waste recycling in Ho Chi Minh city. By conducting this research, we aim to gain a deeper understanding of how individuals in Ho Chi Minh city engage with e-waste recycling. This research is in social science and it utilized quantitative data; therefore, Statistical Package for the Social Sciences (SPSS) is a suitable choice. It is a widely used statistical software package that is particularly suitable for social science research due to its features and capabilities tailored to the field [9]. In addition, the combination of SPSS and AMOS provides a comprehensive toolset for statistical analysis and structural equation modeling (SEM), which is used to analyze complex relationships between variables. These complex relationships are better illustrated in the AMOS diagram assessing various fit indices.

In order to explore the primary findings, this study proposed several hypotheses from the theoretical model and existing literature. In Environmentally Responsible Behavior conceptual model, attitude toward the environment is formed from 2 components: beliefs and knowledge. In 1987 and 1990, Hungerford and Hines indicated that attitude directly influences intention of acting which transforms into environmentally responsible behavior [10], [11]. Arain et al. [12] found that lacking knowledge about disposal sites and access to a recycling facility within a reasonable distance are important elements in consumer decisions. In their research, Diekmann and Preisendorfer suggest that attitude can have an impact on behavior, particularly in low-cost situation [13], [14]. The lower the pressure of cost, the easier for consumers to take their environmental responsibility. Besides, according to Delcea, factors such as gender, age, education, and income play a significant role in predicting individuals pro-recycling behavior [15]. Other studies also prove that law and regulation affect e-waste recycling intention [16], and social norms have influence on behavioral intention [17].

- Hypothesis 1: Awareness and attitude towards e-waste collection and recycling positively affect e-waste recycling intention.
- Hypothesis 2: Law and regulation positively affect e-waste recycling intention.
- Hypothesis 3: The inconvenience of recycling negatively influences e-waste recycling intention.
- Hypothesis 4: Economic factors have a negative impact on e-waste recycling intention.
- Hypothesis 5: Social pressure positively impacts e-waste recycling intention.
- Hypothesis 6: There exists an association between gender, age, education level, income and e-waste recycling intention.

2. Materials and Methods

2.1. Survey design

Based on the critical review of e-waste related literature [15], [16], [12], [18], a question survey was modified evaluating 7 main concepts. This study followed the quantitative method; thus, constructs were clearly stated with the 5-point Likert scale answers. The study considered the individuals' e-waste recycling process, including e-waste awareness (AW), attitude towards e-waste collection and recycling (AT), law and regulations (LR), social influence (SP), economic factors (EF), inconveniences (INC) and recycling intention (RI). In addition, four questions on demographic and socio-economic characteristics regarding gender, age, education level and income were also included in the survey. The aim was to have a sample size of over 1000 respondents. The survey targeted two age groups: 15-22 and 23-45 years old, with three education levels including high school, university, and post-graduate. There were four income levels in the survey: no income, < 4 million, 4-10 million, and over 10 million.

All questions in the survey were mandatory, ensuring that the form should not be submitted with empty data and avoiding missing information. Moreover, an open question was created in order to ensure the participation of all respondents in Ho Chi Minh city. If there were responses from other areas, they

would be eliminated when processing data. The questionnaire for this study can be found in Appendix 1.

2.2. Distribution

This research was conducted in Ho Chi Minh city, the largest city in the southern Vietnam. The questionnaire in this study was generated and hosted using Google Forms in order to facilitate easy approach respondents in the target area. The survey was distributed randomly via various social media platforms. The questionnaire remained available for a period of 3 months, from March to May 2022. A total of 1020 respondents participated in this study, including 630 males and 390 females.

2.3. Data analysis

In this study, the author used IBM SPSS version 26 and AMOS Graphic software version 20 to analyze data. The statistical analysis was performed in descriptive analytics for all demographic data. Furthermore, the exploratory factor analysis (EFA) and the confirmatory factor analysis (CFA) were applied before establishing the structural equation modeling (SEM) for this research.

EFA was used to explore the underlying structures of variables so that helps to identify the underlying factors or dimensions that explain the patterns of correlations among observed variables [19]. In this test, the Kaiser-Meyer-Olkin test (KMO) [20], [21] value ranges between 0 and 1, where higher values indicate a stronger suitability for factor analysis and a KMO value above 0.6 or 0.7 is considered acceptable. If the p-value linked to the Bartlett's test is lower than a predefined significance level (such as 0.05), it implies that the null hypothesis is rejected, indicating that the data is appropriate for factor analysis. This study applied the principal component analysis in varimax rotation and factor loadings to extract constructs from original items. Additionally, to assess the internal consistency and reliability of observed variables, Cronbach's alpha was used. The α value ranges from 0 to 1, which means the closer the value is to 1, the greater the internal consistency of the indicators.

AMOS Graphic software was used to evaluate the fit of a hypothesized factor structure to observed data. During CFA, various fit indices including Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), Goodness-of-Fit Index (GFI), PCLOSE, Chi-square statistic by the degrees of freedom (CMIN/df) were calculated. Subsequently, SEM was created in AMOS to illustrate the complex relationships between observed variables and latent variables. Besides, one-way analysis of variance was run to determine whether there were statistically significant differences in the means of groups.

3. Results and Discussion

3.1. Characteristics of residents' recycling behavior

All main constructs and variables were labeled in Table 1. The standard deviations, which are all below 1, indicate that responses were generally similar among participants. As shown in Table 1, the analysis results indicated that a majority of survey participants expressed their agreement and strong agreement rated 4 and 5 on the Likert scale for variables within the constructs of e-waste awareness, attitude, law and regulation, social pressure, and inconvenience. Furthermore, the findings suggested most consumers were aware of the environmental benefits and personal advantages associated with collecting and recycling electronic waste. A large number of people exhibited concern about the environment and have a desire to contribute towards reducing environmental pollution for a sustainable future. Additionally, consumers showed their endorsement for the collection and recycling of electronic waste, believing that it was individual responsibility and should not be enforced by external factors.

From the results presented from Table 1, it is evident that most consumers perceived that the laws of our country influenced their waste collection activities. Most of respondents agreed that government policies would impact the behavior of e-waste recycling (mean=4.33) and they were willing to participate in courses on e-waste laws and regulations if available (mean=4.41). Although electronic waste is considered hazardous waste, and the management of hazardous waste is uniformly applied to electronic waste, the government has recently made public the legal documents or regulations concerning the collection and processing of electronic waste, but specifically for manufacturers and

corporations rather than for individuals. The absence of specific national policies or guidelines on electronic waste for individuals in Vietnam makes these responses particularly noteworthy.

Table 1. *Constructs with labels used in the questionnaire*

E-waste awareness (AW)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
AW1	Collecting And recycling e-waste reduces resource exploitation for raw materials	1020	3	5	4.25	.707
AW2	Collecting and recycling electronic waste improves environmental quality	1020	3	5	4.31	.660
AW3	Recycling electronic waste allows for the recovery of valuable materials	1020	3	5	4.35	.564
Attitude towards waste collection and recycling (AT)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
AT1	Collecting electronic waste contributes significantly to society	1020	3	5	4.48	.550
AT2	Participating in e-waste collection and recycling supports sustainable development	1020	1	5	4.43	.569
AT3	Organizing activities for collecting and recycling electronic waste is a beneficial solution	1020	3	5	4.46	.536
AT4	Everyone is responsible for recycling electronic waste	1020	3	5	4.47	.515
AT5	I'm interested in ideas for collecting electronic waste	1020	3	5	4.39	.578
Law and regulations (LR)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
LR1	Vietnamese law mandates clear responsibility for citizens in electronic waste recycling.	1020	3	5	4.29	.738
LR2	Government policies will impact the behavior of electronic waste recycling	1020	3	5	4.33	.658
LR3	I will comply with laws and regulations regarding electronic waste recycling.	1020	3	5	4.37	.626
LR4	I will participate in courses on laws and regulations for electronic waste collection and recycling if available.	1020	3	5	4.41	.673
Social pressure (SP)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
SP1	I will join e-waste collection and recycling if my family and friends participate.	1020	3	5	4.34	.617
SP2	Media influences e-waste collection and recycling.	1020	3	5	4.37	.667

SP3	My local community impacts my e-waste collection and recycling involvement.	1020	3	5	4.39	.597
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Table 1. Construct with labels used in the questionnaire (continued)

Economic factors (EF)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
EF1	High transportation costs for e-waste recycling.	1020	3	5	3.87	.742
EF2	High fees for electronic waste collection and recycling.	1020	2	5	3.91	.684
EF3	Costly recycling programs.	1020	3	5	4.06	.534
EF4	Benefits of participating in e-waste collection and recycling: incentives, promotions, etc.	1020	3	5	4.01	.580
Inconveniences (INC)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
INC1	I find it difficult to classify electronic waste for recycling	1020	2	5	4.12	.649
INC2	I don't have time to take electronic waste to a collection point.	1020	2	5	4.14	.634
INC3	I find the transportation of electronic waste to a collection point is very inconvenient	1020	3	5	4.16	.641
INC4	Current e-waste collection programs lack collection points	1020	2	5	4.18	.624
Recycling intention (RI)						
	Describe observed variables	N	Minimum	Maximum	Mean	S.D.
RI1	I am willing to participate in e-waste collection models when available	1020	3	5	3.73	.564
RI2	I am willing to learn about participating in e-waste collection models	1020	1	5	3.71	.592
RI3	I will convince my relatives to join e-waste collection model.	1020	3	5	3.67	.499

From the findings in Appendix 2, it revealed that over 90% of people agreed that if their family and close ones are involved in the activities of collecting and recycling electronic waste, they would also participate. Regarding SP2, nearly 90% of participants agreed and strongly agreed that mass media, when broadcasting more information about electronic waste collection, creates a sense of community, thereby encouraging participation. Moreover, the community in which individuals reside also influences their decision to participate in electronic waste collection and recycling activities. This is because a certain segment of consumers tends to mimic others' actions, leading to a domino effect within a community that prioritizes environmental protection and displays a proactive action. Besides, regarding inconveniences, consumers found the process of collecting electronic waste to be highly inconvenient. Most people currently spend more time on personal work rather than dedicating significant time to participate in the collection and recycling of electronic waste.

By contrast, for the variables in economic factors and recycling intention, the majority of survey participants selected 'neutral' (rated 3) and 'agree' (rated 4) on the Likert scale. It is observed from the

result that currently, consumers are not yet ready to pay for the collection and recycling of electronic waste. Most of respondents expressed their concerns regarding the high cost of transport and fee for collection and recycling, with the mean value reaching 3.87 and 3.91 respectively. However, consumers still believe that collecting and recycling electronic waste will be beneficial to improve the environmental quality (with mean value=4.0.6). Moreover, consumers are more likely to show willingness to engage in collecting e-waste models, in case they perceive economic benefits like incentives and promotions (mean=4.01).

3.2. The structural model

Exploratory Factor Analysis (EFA) was performed to uncover all underlying dimensions or factors that account for the observed variables in the dataset. The pattern matrix was generated with all loading factors > 0.5. Variable AT1 was omitted as it loaded on 2 factors in the matrix when running the first EFA test. Therefore, the EFA test was reevaluated in the second time with 25 variables. The results showed that the KMO coefficient = 88.7% was above the recommended 0.5 with the sig value = 0.000 < 0.05, indicating that factor analysis was appropriate for the research data. The Cronbach's alpha test was used to assess the reliability of each construct, as shown on Table 2. The result from the Eigenvalue Explained table shows that 25 initial variables were classified into 6 groups. These groups shall be renamed accordingly into: Attitude and Awareness (factor 1), Law and Regulation (factor 2), Inconvenience (factor 3), Economic factors (factor 4), Recycling Intention (factor 5), and Social Pressure (factor 6). The correlation among these factors can be found in Figure 1.

Table 2. Rotated component matrix with loading factors and Cronbach's α value

Construct	Item	Main factor						Cronbach's α value
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	
Attitude and Awareness	AT4	0.809						0.921
	AT5	0.796						
	AW3	0.794						
	AW2	0.791						
	AW1	0.788						
	AT3	0.783						
	AT2	0.782						
Law and Regulation	LR2		0.821					0.848
	LR1		0.816					
	LR3		0.810					
	LR4		0.802					
Inconvenience	INC3			0.750				0.766
	INC2			0.741				
	INC4			0.699				
	INC1			0.694				
Economic Factor	EF3				0.741			0.709
	EF4				0.696			
	EF2				0.694			
	EF1				0.680			
	R11					0.793		0.728

Recycling Intention	RI2	0.778	
	RI3	0.772	
Social Pressure	SP3	0.785	0.708
	SP2	0.705	
	SP1	0.702	

Subsequently, CFA test was performed to assess the model fit. From the results in Table 3, the overall model fit including absolute, incremental and parsimonious indices of fit measure was examined. As can be seen that, the ratio CMIN/df had the value of 4.193 (less than the recommended value of 5.000) in this model, indicating a reasonable fit [22]. Additionally, other important indicators were used to assess the model fit, including Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness Fit of Index (AGFI), Tucker Lewis Index (TLI), Comparative Fit Index (CFI) [23]. Other indicators in incremental and parsimonious indices were also examined in Table 3. All these indicators satisfied the threshold of recommended values; therefore, it can be concluded that the measurement model had a fit.

Table 3. Goodness-of-fit test results for the model [16], [24]

	Indicators	Criteria	Result	Judgement
Absolute fit measure	χ^2	p-value < 0.05		Reasonable Fit
	GFI	>0.9	0.92	Good fit
	AGFI	>0.9	0.9	Good fit
	RMSEA	<0.08	0.056	Good fit
Incremental fit measure	PCLOSE	<0.05	0.02	Good fit
	NFI	>0.9	0.903	Good fit
	TLI	>0.9	0.912	Good fit
	CFI	>0.9	0.924	Good fit
	IFI	>0.9	0.924	Good fit
Parsimonious fit measure	PGFI	>0.5	0.738	Good fit
	PNFI	>0.5	0.785	Good fit
	PCFI	>0.5	0.804	Good fit
	CMIN/df	<5	4.193	Reasonable fit

AMOS graphic was then used to create the structural equation modeling (SEM). The propose model was built based on the pattern rotated matrix of EFA test, which illustrated the correlation coefficient among factors and recycling intention. As showed in Figure 1, e-waste awareness and attitude towards waste collection and recycling, social pressure, economic factors and inconveniences have an impact on e-waste recycling intention. However, considering the variables in law regulation factor with sig = 0.564 > 0.05, we can conclude that law and regulation do not influence e-waste recycling intention. Thus, the significant relationship between factors in both positive and negative effects indicates that hypothesis 1, hypothesis 3, hypothesis 4, and hypothesis 5 was supported, while hypothesis 2 was not confirmed because there was no statistically significant association between e-waste recycling intention and laws.

After assessing the impact relationships among variables, we proceeded to examine the strength of their effects using standardized regression coefficients. Among the independent variables affecting the intention to recycle electronic waste, the Social Pressure factor group showed the strongest coefficient, with an impact coefficient of 0.360. This suggests that most residents in Ho Chi Minh City are likely to participate in electronic waste collection models if their family, friends, and community members are involved. Additionally, media also significantly influences their readiness. Therefore, media and public

awareness campaigns need to be designed effectively to appeal a larger number of individuals who are willing to participate in e-waste collection.

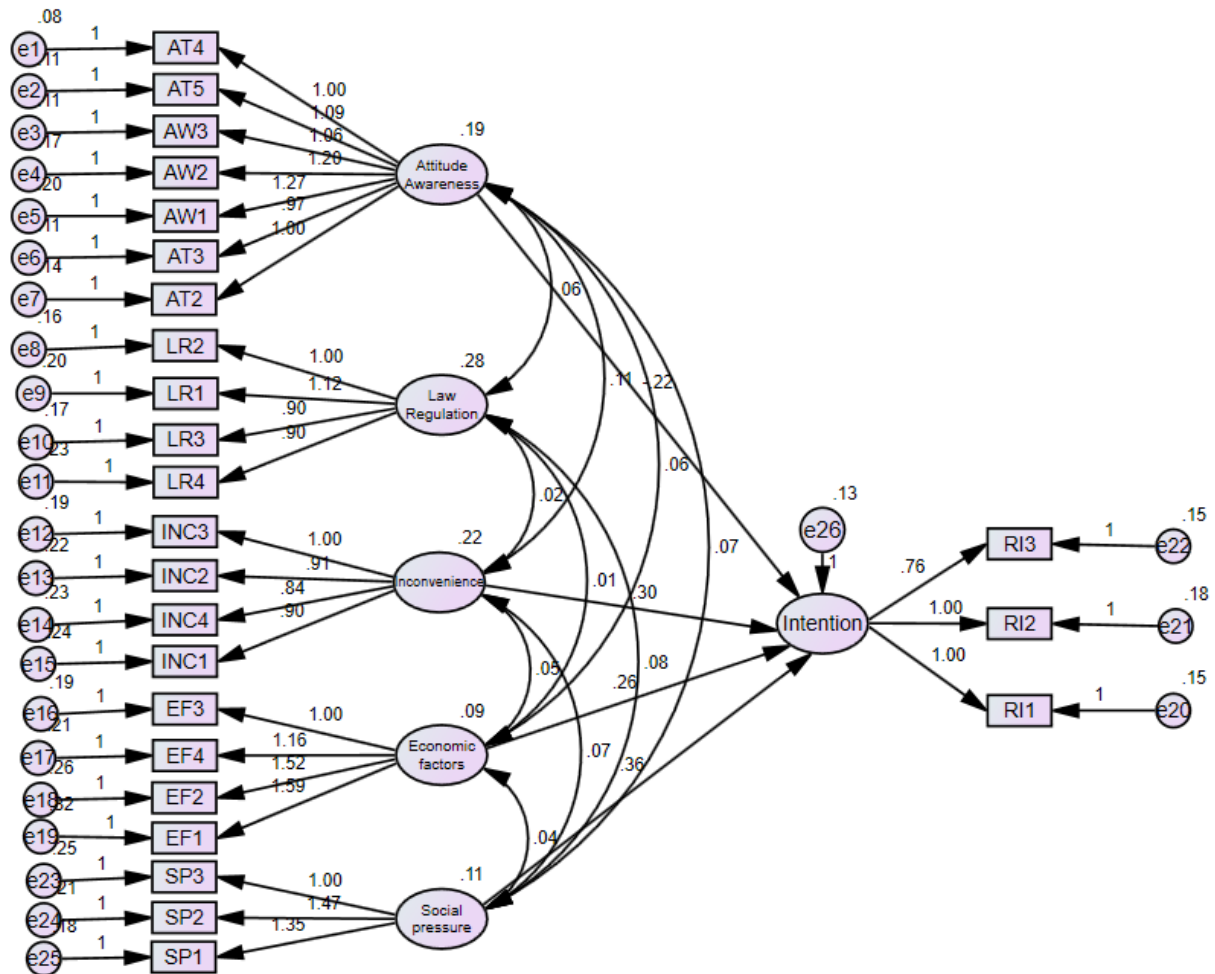


Figure 1. The proposed model

According to the result in Figure 1, inconvenience emerged as the second most influential factor on electronic waste recycling behavior, with an impact coefficient of 0.304. The majority of respondents perceive inconvenience in terms of time, effort, and the limited availability of collection and recycling points. This suggests that inconvenience can adversely affect the willingness to participate in e-waste collection models. Following inconvenience, economic factors showed a coefficient of 0.276, indicating that residents have not fully recognized the economic benefits relating to participating in e-waste collection models. Instead, people place greater emphasis on convenience, social pressure, awareness, and attitudes.

The least impact was from environmental awareness and attitudes towards recycling, with an impact coefficient of -0.224. This indicates that environmental awareness and attitudes towards waste collection and recycling had a negative impact on the willingness to participate in electronic waste collection models. It can be concluded that environmental awareness and attitudes towards recycling, referring to residents' awareness of the environmental consequences of e-waste and their responsibility for environmental protection, have strongly contributed to people's readiness to engage in recycling activities.

3.3. The measurement variance test of socio-demographic characteristics

The statistical results revealed that the survey had a higher number of male participants compared to females, with 61.8% (630 votes) being males and only 38.2% (390 votes) being females. In both age groups surveyed, the participation rate of males was higher than that of females. The tendency can be

attributed to the tradition where males are typically more interested in electronic devices and frequently update or replace personal devices such as mobile phones, as compared to females. Therefore, it is understandable that males showed a stronger interest in this survey. Regarding age and educational level, the largest number of participants fell within the age range of 23-45 years with college or university degrees, accounting for 52.5%.

Table 4. Profile of respondents (n=1020 persons)

Demographic and Socio-economic variables	Groups	Frequency	Percent (%)
Gender	Male	630	61.8
	Female	390	38.2
Age	15-22	484	47.5
	23-45	536	52.5
Education level	High school	198	19.4
	University	536	52.5
	Post graduate	286	28.0
Income	No income	435	42.6
	< 4 million	228	22.4
	4-10 million	259	25.4
	= > 10 million	98	9.6

A one-way ANOVA test was performed to determine whether there are significant differences between socio-demographic characteristics and factors that affect residents towards e-waste recycling intention. As shown in Table 5, gender, education level and income had statistically significant influences on e-waste awareness and attitude, law and regulation, inconveniences, economic factors, recycling intention and social pressure.

Table 5. One-way ANOVA test among socio- demographic characteristics and factors

Socio-demographic variables	Gender		Age		Education level		Income	
	F	P-value	F	P-value	F	P-value	F	P-value
AT and AW	973.532	0.000	-	-	321.691	0.000	331.407	0.000
LR	95.268	0.000	17.292	0.000	4.731	0.009	40.421	0.000
INC	43.927	0.000	-	-	81.272	0.000	21.052	0.000
EF	45.881	0.000	-	-	50.598	0.000	18.265	0.000
RI	10.227	0.001	-	-	24.638	0.000	7.845	0.000
SP	121.382	0.000	-	-	30.919	0.000	38.582	0.000

In particular, there were positive correlations between education level and e-waste awareness and attitude ($r=0.595$), law and regulation ($r=0.086$), inconveniences ($r=0.103$), economic factors ($r=0.295$), recycling intention ($r=0.210$) and social pressure ($r=0.206$) as shown in Table 6. These findings were in line with numerous previous studies [12], [18], [25], [26]. Nonetheless, in one study about e-waste recycling behavioral intention in Da Nang- a city in the central part of Vietnam, it found that income was not statistically significant for any mentioned factors [16].

In addition, age only had a relationship with law and regulation among factors. This study found that there was a negative association between age and law, with $r=-0.129$, significant at $p=0.000$ (Table 6). Accordingly, younger people tended to agree more with law and regulation for e-waste. The willingness

to comply and participate in courses on laws and regulations for e-waste and recycling of younger people was higher. To sum up, it can be concluded that there exists an association between gender, education level, income and e-waste recycling intention, except age.

Table 6. Correlation among socio- demographic characteristics and factors

	AT and AW	LR	INC	EF	RI	SP
Gender	0.699**	0.293**	0.203**	0.208**	0.100**	0.326**
Age	-	-.129**	-	-	-	-
Education level	0.595**	0.086**	0.103**	0.295**	0.210**	0.206**
Income	0.680**	0.244**	0.189**	0.189**	0.139**	0.213**

** Correlation is significant at the 0.001 level (2-tailed).

4. Conclusion and recommendation

According to this research, several factors have been identified as influential in shaping people's recycling intentions in Ho Chi Minh city. These factors include education, income, awareness and attitude, inconveniences of e-waste recycling, and social pressure. Individuals with higher education levels possess a better understanding of environmental topics, such as recycling. These people tend to acknowledge the advantages of recycling and engage in responsible waste management practices. Income level can also influence recycling intentions. In general, individuals with higher incomes may be more willing to invest in environmentally-friendly behaviors, such as recycling e-waste. If the collection and recycling mechanisms are not convenient, individuals may be less motivated to participate in recycling activities, despite individuals being aware of the advantages of recycling e-waste. Finally, it is impossible to ignore the impact of social pressure. People are more likely to recycle when they perceive that their friends or community appreciate or expect them to recycle. The findings indicate that residents in Ho Chi Minh city have been aware of e-waste recycled condition. However, more works should focus on promoting residents' willingness in e-waste recycling. In conclusion, the findings indicate that factors regarding education, income, awareness and attitude, inconveniences of e-waste recycling and social pressure have impacts on e-waste recycling and they need to be comprehensively understood so that they can aid policymakers, educators, and interested parties in developing effective strategies to promote recycling intentions in Ho Chi Minh city, Vietnam.

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Conflict of Interest

The authors declare no conflict of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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APPENDIX

Appendix 1. Questionnaire

Cross X on your choice		Disagree		Agree	
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Part 1	Strongly disagree		Neither agree or disagree		Strongly agree
<p>E-waste awareness (AW) Q1. Collecting And recycling e-waste reduces resource exploitation for raw materials. (AW1) Q2. Collecting and recycling electronic waste improves environmental quality. (AW2) Q3. Recycling electronic waste allows for the recovery of valuable materials. (AW3)</p>					
<p>Attitude towards waste collection and recycling (AT) Q4. Collecting electronic waste contributes significantly to society. (AT1) Q5. Participating in e-waste collection and recycling supports sustainable development. (AT2) Q6. Organizing activities for collecting and recycling electronic waste is a beneficial solution. (AT3) Q7. Everyone is responsible for recycling electronic waste. (AT4) Q8. I'm interested in ideas for collecting electronic waste. (AT5)</p>					
<p>Law and regulations (LR) Q9. Vietnamese law mandates clear responsibility for citizens in electronic waste recycling. (LR1) Q10. Government policies will impact the behavior of electronic waste recycling. (LR2) Q11. I will comply with laws and regulations regarding electronic waste recycling. (LR3) Q12. I will participate in courses on laws and regulations for electronic waste collection and recycling if available. (LR4)</p>					
<p>Social pressure (SP) Q13. I will join e-waste collection and recycling if my family and friends participate. (SP1) Q14. Media influences e-waste collection and recycling. (SP2) Q15. My local community impacts my e-waste collection and recycling involvement. (SP3)</p>					
<p>Economic factors (EF) Q16. High transportation costs for e-waste recycling. (EF1) Q17. High fees for electronic waste collection and recycling. (EF2) Q18. Costly recycling programs. (EF3) Q19. Benefits of participating in e-waste collection and recycling: incentives, promotions, etc. (EF4)</p>					
<p>Inconveniences (INC) Q20. I find it difficult to classify electronic waste for recycling. (INC1) Q21. I don't have time to take electronic waste to a collection point. (INC2) Q22. I find the transportation of electronic waste to a collection point is very inconvenient. (INC3) Q23. Current e-waste collection programs lack collection points. (INC4)</p>					
<p>Recycling intention (RI) Q24. I am willing to participate in e-waste collection models when available. (RI1) Q25. I am willing to learn about participating in e-waste collection models. (RI2) Q26. I will convince my relatives to join e-waste collection model. (RI3)</p>					
Part 2:					
Q1. Gender	Male	Female			
Q2. Age	15-22 years old	23-45 years old			
Q3. Education	High school	University	Post graduate		

Q4. Income	No income	<4 million	4-10 million	>10 million
Q5. Where do you live?	Ho Chi Minh city	Other		

APPENDIX 2. Frequency table

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
AW1	0%	0%	15.7%	44%	40.3%
AW2	0%	0%	11.1%	46.9%	42.1%
AW3	0%	0%	4.5%	56%	39.5%
AT1	0%	0%	2.6%	46.5%	50.9%
AT2	0.1%	0%	3.3%	49.8%	46.8%
AT3	0%	0%	2%	50.3%	47.7%
AT4	0%	0%	0.8%	51.3%	43.8%
AT5	0%	0%	4.8%	51.4%	43.8%
LR1	0%	0%	17%	37.2%	45.9%
LR2	0%	0%	10.6%	45.8%	43.6%
LR3	0%	0%	7.8%	47%	45.2%
LR4	0%	0%	10.5%	37.7%	51.8%
SP1	0%	0%	7.8%	50.8%	41.4%
SP2	0%	0%	10.6%	42.2%	47.3%
SP3	0%	0%	6%	49.5%	44.5%
EF1	0%	0%	34.6%	43.4%	22%
EF2	0%	0.4%	27.3%	53.5%	18.8%
EF3	0%	0%	11.3%	71.1%	17.6%
EF4	0%	0%	16.1%	66.4%	17.5%
INC1	0%	0.1%	15.5%	56.9	27.5%
INC2	0%	0.2%	13.4%	58.4%	27.9%
INC3	0%	0%	13.8%	56.5%	29.7%
INC4	0%	0.1%	11.7%	57.9%	30.3%
RI1	0%	0%	33.3%	60.7%	6%
RI2	0%	0%	35.8%	57.3%	6.9%
RI3	0%	0%	34.5%	64.1%	1.4%