The Effect of Social Media Marketing on Consumers' e-Waste Recycling Intention to Participate: The Case of the Vietnamese Market

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Abstract: According to the United Nations, the world generates about 61.3 million tons of electronic waste yearly, increasing at a significant rate of 3-5% per year, with nearly $10 billion of precious metals wasted in e-waste. In contrast, global recycling rates fall to approximately 17%. Improper e-waste dismantling leads to severe health hazards, environmental issues, and resource conservation. Therefore, handling e-waste correctly is the top priority that needs to be addressed, and recycling is the safest and most effective method. This study adopts the SOR model to examine the effect of social media marketing on consumers' intention to participate in e-waste recycling programs. The study utilized data from 345 Vietnamese consumers, as the nation is recognized for the rapid increase in discarded electronic products. SmartPLS 4.0 was used to analyze the collected data. The findings highlight the use of social media marketing in influencing consumers' recycling intention and reveal a sequential mediation in which social media marketing impacts consumers' e-waste recycling intention through the link of consumers' attitudes and perceived behavioral control. This study contributes to existing knowledge by highlighting social media marketing as a critical tool for promoting consumers' recycling practices. The sequential mediation found in the study suggests a practical marketing strategy for policymakers and businesses to encourage consumers to maintain their e-waste intention to participate.

Keywords: E-waste recycling, SOR, Social media marketing, Vietnam

1. Introduction

Global electrical and electronic waste is alarmingly growing, as Forti (2020) predicted, to reach 74 million tons by 2030, doubling the amount from 2014. Electronic waste worldwide can be processed through formal or informal recycling systems. Formal e-waste recycling, which requires cutting-edge equipment to recover salvageable materials properly, is costly. Developing countries use informal recycling procedures to collect resources from e-waste, exposing workers to the harmful contents of e-waste. This improper e-waste processing begets significant disruptions to community health, environmental issues, and resource preservation. Therefore, the expanding global efforts in e-waste recycling aim to strictly manage the sources of e-waste to minimize negative impacts on environments and communities. Hence, consumers' involvement in e-waste recycling plays a crucial role in sustainable development.

Social media is becoming popular with most people, and it is an effective means for organizations and governments to convey messages about sustainable development. However, the impact of marketing messages for e-waste recycling practices on consumers' habit of recycling has been inadequately examined. We adopt the Stimuli-Organism-Response framework to investigate the effects of social media marketing on pro-environmental behavior in the context of e-waste recycling. We propose that social media marketing influences consumers' habits through its impact on shaping their attitudes and perceptions of behavioral control. The study also adds insights into the practices in Vietnam, a developing country with increasing e-waste. Based on our results, the government and businesses could develop initiatives that motivate e-waste recycling more effectively and encourage consumers to engage more actively in e-waste programs.

2. Theoretical Background

Stimulus-Organism-Response (SOR) theory was a psychological behavior theory developed by Mehrabian and Russell in 1974, focused on exploiting the influence of stimulus factors on an individual's behaviors. The stimulus factor in this model refers to external variables, Organisms represent consumers' emotions and perceptions, and Response refers to their reactions after receiving stimulus and self-awareness. This model describes the closed connection between Stimulus-Organism-Response; when stimulus factors influence the individual's attitude and perception, they will have a response-like behavior (Mehrabian and Russell, 1974; Jacoby, 2002; Shen and Khalifa, 2012). In the context of sustainability, especially in the e-waste context, social

media marketing is still unexplored as a stimulus factor to promote the recycling intention of consumers. Moreover, researchers have found conflicting effects of social media marketing on consumers' behavior (Karimi et al., 2021; Nekmahmud et al., 2022; Trivedi et al., 2018; Ying & Wang, 2019), which suggests a potential for a mediation effect. Adopting this SOR framework, this study considers the attitude and perceived behavioral control for e-recycling practices as the mediators that transfer the impact of social media marketing on consumers' intention to participate in e-waste recycling.

3. Hypotheses Development

3.1 Social Media Marketing

Social media marketing (SMM) is a business's marketing campaign to disseminate content to consumers and is considered a practical option for advertisers in the digital economy (Lee et al., 2018). It has been shown to positively influence consumers' behavior to engage in pro-environmental behavior (Hynes and Wilson, 2016; Minton et al., 2021). This effect is due to the information and entertainment that advertisements communicate to consumers and the two-way communication between the advertisers and consumers (Dao et al., 2015). The information regarding e-waste programs included in social media marketing highlights the environmental value of recycling practices. Therefore, it is proposed that the following:

H1(+): Social media marketing has a positive impact on consumers' intention to participate in e-waste recycling programs

Minton et al. (2012) showed that advertising on social media promotes consumers' green behavior for recycling, green transportation, organic food, recycling, charity, and anti-materialism by emphasizing their motives for involvement in green practices. As attitude is an association between an object and an evaluation of the object (Fazio, 1995), customers likely form positive perceptions toward recycling when interacting with green advertisements on social media platforms. Therefore, it is offered that:

H2(+): Social media marketing has a positive impact on attitudes toward e-recycling

Perceived behavioral control is the individual's assessment of the difficulty or ease of performing a behavior (Ajzen, 1985). This construct is based on the individual's confidence in performing a practice. The more resources and opportunities an individual has to perform an activity, the more favorable the environment, the fewer constraints to adopt the behavior, and the greater the perceived control of behavior. Sustainable advertising often provides information on green issues to promote supportive behavior (Liu et al., 2022). Social media allows two-way communication between the organization and consumers so they can seek information and clarify concerns over the practices for recycling (Rosenthal and Linder, 2021). Consumers can gain more confidence in the practice with sufficient information on what to do and how to recycle. Therefore, it is suggested that:

H3(+): Social media marketing positively impacts perceived behavioral control.

3.2 The Effects of Attitude and Perceived Behavior Control

E-waste products refer to all electrical and electronic equipment the owner discards with no intention to reuse. Examples of e-waste are tablets, monitors, mobiles, computers, notebooks, refrigerators, washing machines, digital cameras, power cords, banks, desktops, memory cards, laptops, and speakers. E-waste recycling includes routine cleaning, storing, sorting, moving, separating, disassembling, upgrading, returning, incinerating, disposing, reusing, giving or donating, or selling the wasted product (Aboelmaged, 2021). In the e-waste literature, attitude and perceived behavioral control affect the intention to participate in e-waste recycling (Thukral et al., 2022). Therefore, it is offered:

H4(+): Consumers'attitude toward e-waste recycling is positively associated with their intention to participate in e-waste recycling

H5(+): Consumers'perceived behavioral control toward e-waste recycling is positively associated with their intention to participate in e-waste recycling

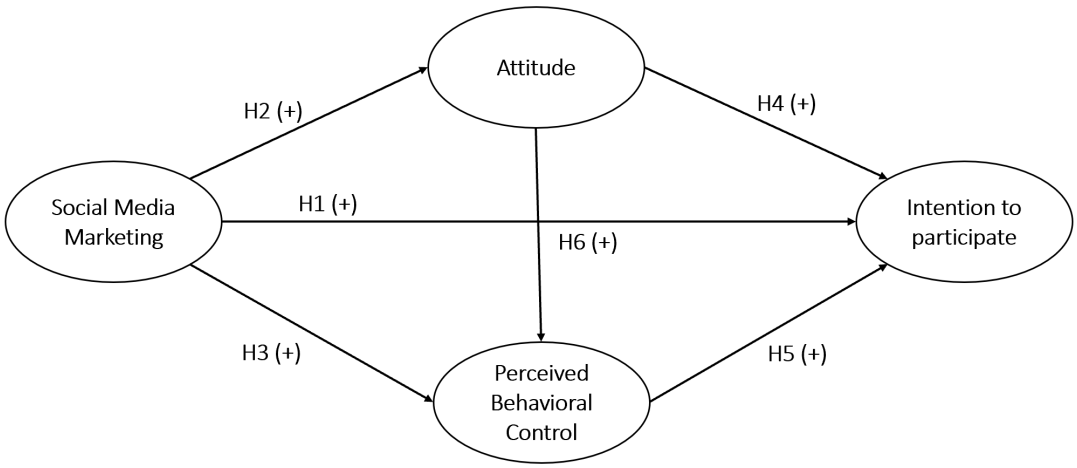

Figure 1: Conceptual model

Minton et al. (2012) showed that contemporary consumers have now passed the point where they are committed to green practices for rewards and become more actively involved in sustainable actions. This intrinsic motivation for sustainability is linked with a positive attitude toward recycling and can motivate consumers to seek information on processing recyclable wastes (Rosenthal & Linder, 2021). More information on practical solutions can help consumers gain confidence in their practices. Therefore, it is proposed that:

H6(+): consumers' attitude toward e-waste recycling is positively associated with their Perceived Behavioral Control of e-recycling

4. Methodology

4.1 Data Collection and Sampling

The study used a convenient sampling technique to collect data. We surveyed 345 consumers from December 21, 2023 to January 6, 2024. Respondents live in Ho Chi Minh City, where e-waste issues are becoming more serious, and the consumers' awareness of these issues has not been high. A Google Forms was distributed to young consumers active on social media platforms.

Table 1 Shows the sample demographic, the proportion of females to males is one to one (51.1% and 48.9% respectively). This gender structure is similar to the gender ratio in Ho Chi Minh City (48.7% for males and 51.3% for females). Most of the responses are from university students between 19 and 25, with monthly income below 10,000,000 VND (approximately equivalent to US$400) and the frequency of their exposure to sustainability content on social media.

4.2 Measurement of Constructs

The study used a total of four constructs, including Social Media Marketing (7 Indicators) adapted from Nekmahmud et al. (2022), the other three constructs of attitude toward e-waste recycling (6 Indicators), Scales to measure Perceived Behavioral Control (7 Indicators) and intention to participate in e-waste recycling programs (5 Indicators) were adopted from Sari et al., (2021). All constructs were measured by a Five-point Likert scale, ranging from 1 for "Strongly disagree" to 5 for "Strongly agree".

Table 1: Demographic Statistics

Variable	Category	Frequency	Percentage
Gender	Male	146	42.3
	Female	199	57.7
Age Group	15-18	74	21.4
	19-25	271	78.6
Education	Secondary School	15	4.3
	High School	17	4.9
	College	6	1.7
	University	301	87.2
	Master's degree or higher	6	1.7
Monthly Income (VND)	< 10,000,000	312	90.4
	10,000,000 - 20,000,000	24	7.0
	20,000,001 - 30,000,000	4	1.2
	30,000,001 - 40,000,000	3	.9
	> 40,000,000	2	.6
Frequency	Never	6	1.7
	Rarely	40	11.6
	Sometimes	161	46.7
	Usually	106	30.7
	Every day	32	9.3

4.3 Analysis Methods

SPSS 25 software was used to clean the collected data and show the sample descriptions. After that, we used SmartPLS 4.0 software to analyze measurement and structural models. The partial least squares structural equation modeling (PLS-SEM) method was used to evaluate the structural model. Data was first analyzed to assess the inner model for the validity and reliability of the constructs. Subsequently, the model was assessed using criteria of R2, f2, and coefficients of relationships in the model.

5. Data Analysis and Results

5.1 Measurement Model

Cronbach's alpha and composite reliability were used to assess datasets' reliability and internal consistency. All variables have Cronbach's Alpha coefficient values and Composite Reliability values exceeding 0.7 and lower than 0.9, demonstrating that the latent variables have qualified internal consistency and reliability (Hair et al., 2014). Item removal was made to ensure the convergent validity of the constructs. The final measurement model satisfies all thresholds for Cronbach's Alpha, Composite Reliability, and AVE, as shown in Table 2. Discriminant validity of the constructs is shown in Table 3 and Table 4.

5.2 Structural Equation Model

Figure 2 shows the variation of endogenous variables. The model can explain 58.4% of the variance of intention to participate, 23.1% of the variance of attitude, and 34.5% of perceived behavioral control.

Social media marketing positively influences intention to participate with a small effect size (β=0.137; p=0.010, f^2=0.034). Therefore, hypothesis H1 is accepted. Social media marketing also has a positive impact on attitude (β=0.484; p <0.001, f2=0.3) and on Perceived Behavioral Control (β=0.227; p <0.001, f2=0.06). It can be seen that social media marketing has a more substantial effect on Attitude ($f2$ = 0.30) compared to the relationship with Perceived Behavioral Control ($f2$ = 0.061). These results support both hypotheses H2 and H3. Results show that both attitude and perceived behavior control have influence on E-waste Recycling intention to participate with a large effect size (β=0.418; p < 0.001, $f2$ = 0.153), while Attitude has a positive effect on the intention with a medium effect size (β=0.358; p < 0.001, $f2$ = 0.214) (see Figure 2).

The impact of Attitude on Perceived Behavioral Control is also significantly positive with a medium effect size (β=0.443; p < 0.001, *f*2 = 0.231), confirming H6.

Table 2: Factor loading, the Cronbach's alpha, CR, and AVE values

Variables	Indicators	Loading Factor	Cronbach's Alpha	Composite Reliability	AVE
Attitude	AT1	0.718	0.837	0.881	0.552
	AT2	0.743			
	AT3	0.741			
	AT4	0.788			
	AT5	0.754			
	AT6	0.710			
Perceived Behavioral Control	PBC2	0.654	0.763	0.841	0.516
	PBC4	0.697			
	PBC5	0.800			
	PBC6	0.779			
	PBC7	0.648			
Social Media Marketing	SMM1	0.690	0.899	0.921	0.625
	SMM2	0.704			
	SMM3	0.803			
	SMM4	0.834			
	SMM5	0.842			
	SMM6	0.817			
	SMM7	0.830			
E-waste recycling intention to participate	IP1	0.808	0.850	0.893	0.625
	IP2	0.759			
	IP3	0.787			
	IP4	0.775			
	IP5	0.823			

Table 3: Fornell-Larcker Criterion

	AT	IP	PBC	SMM
AT	0.743			
IP	0.344	0.799		
PBC	0.575	0.478	0.718	
SMM	0.484	0.268	0.459	0.791

Note: SMM stands for social Media Marketing, AT stands for attitude, PBC stands for perceived behavioral control, and IP stands for intention to participate in e-waste recycling. The square root of AVE for discriminant validity is placed along the diagonal; off the diagonal are the correlations among constructs.

Table 4: Heterotrait-Monotrait ratio (HTMT)

Variables	Item Indicators	Correlations			
		AT	IP	PBC	SMM
AT	6				
IP	5	0.440			
PBC	5	0.711	0.642		
SMM	7	0.549	0.329	0.551	

Note: SMM – Social Media Marketing, AT – attitude; PBC – perceived behavioral control; IP - E-waste recycling intention to participate.

Table 5: Specific indirect effects (mediation analysis)

Path	β	SD	T statistics	P value
SMM – PBC - IP	0.107	0.033	3.268	0.001
SMM – AT – PBC – IP	0.100	0.020	5.088	0.000
SMM – AT – IP	0.149	0.032	4.668	0.000
SMM – AT – PBC	0.213	0.043	4.960	0.000
AT – PBC – IP	0.209	0.033	6.279	0.000

Note: SMM – Social Media Marketing, AT – attitude; PBC – perceived behavioral control; IP - E-waste recycling intention to participate.

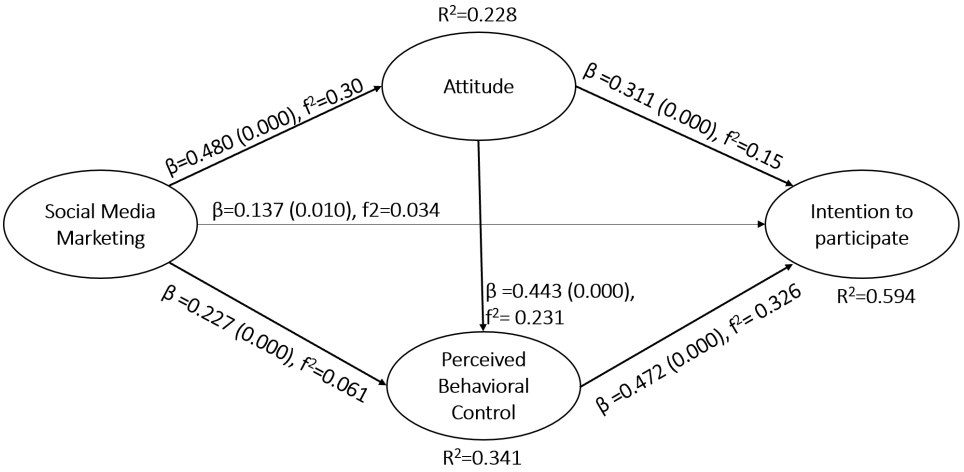

Figure 2: Testing results

6. Discussions

Adopting the Stimuli-Organism-Response theory, this study investigated the effect of social media marketing on consumers' intention to participate in an e-waste recycling program. While social media marketing has been found to influence consumers' sustainability behavior (Nekmahmud et al., 2022; Ying and Wang., 2019), its effect on e-waste recycling has not been adequately explored.

The findings of this study emphasized the use of social media marketing in promoting appropriate recycling practices for consumers. While only 20% of e-waste produced was recognized, collected, and recycled in 2018, the findings of this study point out an essential factor that promotes proper e-waste recycling practices. The result shows that social media marketing influences consumers' intentions through its effect on attitudes toward e-waste recycling. This is consistent with previous research that has confirmed this effect in various green contexts, such as food waste (Teoh et al., 2021), and green cosmetics (Pop et al., 2020). The findings of the study also corroborate with previous studies that point out that social media marketing affects pro-environmental behavior (Karimi et al., 2021) through perceived behavior control. An important of this study is to show that attitude positively impacts perceived behavioral control, revealing a sequential mediation effect transfering the effect of social media marketing on consumers' intention to participate in e-waste recycling programs.

This study focused solely on individuals aged 19 to 25 in HCMC. While this sample size was statistically significant, potential limitations exist in the generalizability of the findings to other demographics or areas. Future studies could broaden the location and age range to understand consumers' habits better. Moreover, our research only examined one external factor influencing internal factors that shape consumers' e-waste recycling habits. Future research should incorporate more factors to offer a more comprehensive understanding of the determinants of consumers' e-waste recycling behaviors.

7. Conclusion

The study investigates the effect of social media marketing on consumers' intention to participate in e-waste recycling programs. Adopting the SOR theory, the study reveals that social media marketing impacts consumers' participation intention through a series of mediation effects: attitude toward recycling, perceived behavioral control of recycling activities, or the linkage between attitude and perceived behavioral control. These findings emphasize the use of information in social media marketing to highlight the values of recycling activities and make consumers perceive their recycling practices as feasible and convenient. This insight assists policymakers and businesses in developing and promoting social marketing campaigns related to sustainability and the environment, thereby fostering the formation of e-waste recycling intention among consumers.

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Appendix A

Construct	Item	Measurement	Reference
Intention to participate	IP1	I plan to participate in e-waste recycling programs by bringing my used electronics to recycling centres	(Sari et al., 2021)

Construct	Item	Measurement	Reference
	IP2	I am willing to participate in e-waste recycling programs by bringing my used electronics to recycling centers	
	IP3	I would consider participating in e-waste recycling programs by bringing my used electronics to recycling centers	
	IP4	I hope to participate in e-waste recycling programs by bringing my used electronics to recycling centers	
	IP5	I want to participate in e-waste recycling programs by bringing my used electronics to recycling centers	
Perceived Behavioral Control	PBC1	I feel uncomfortable participating in e-waste collection programmes by bringing my used electrical devices to recycling programmes.	(Sari et al., 2021)
	PBC2	The decision of whether I participate in e-waste recycling programmes or not is entirely up to me.	
	PBC3	I do not know how to participate, but I want to participate in the e-waste recycling programmes.	
	PBC4	I have the resources, time, will, and opportunity to participate in e-waste recycling programmes by bringing my used electrical devices to recycling programmes.	
	PBC5	I believe that if I want, I can participate in e-waste recycling programmes by bringing my used electrical devices to recycling programmes.	
	PBC6	I believe that I can participate in e-waste recycling programmes by bringing my used electrical devices to recycling programmes.	
	PBC7	I feel that participating in e-waste recycling programmes by bringing my used electrical devices to the recycling programmes is not entirely within our control.	
Attitude toward sustainability	ATT1	I think e-waste recycling programmes by bringing my used electronic devices to recycling programmes is useful and profitable.	
	ATT2	I think participating in e-waste recycling programmes by bringing my used electronic devices to recycling programmes is important for protecting the environment.	
	ATT3	I think participating in e-waste recycling programmes by bringing my used electronic devices to recycling programmes is useful for reducing natural resource shortages.	
	ATT4	I think participating in e-waste recycling programmes by bringing my used electronic devices to recycling programmes is a good idea.	
	ATT5	I like the idea of participating in e-waste recycling programmes by bringing my used electronic devices to recycling programmes.	
	ATT6	I support participating in e-waste recycling programmes by bringing my used electronic devices to recycling programmes.	
Social Media Marketing	SMM1	I receive information from people on social media that e-waste recycling programmes can contribute to human health and protect the environment.	
	SMM2	Using social media to search for information about e-waste recycling programmes that I am thinking about buying is very fashionable.	
	SMM3	I would like to share information from social media about e-waste recycling programmes with my friends.	
	SMM4	Social media marketing is a good source of e-waste recycling programmes information and supplies relevant programmes information.	
	SMM5	Social media advertising about e-waste recycling programmes provides timely information.	
	SMM6	Social media advertising is a good source of up-to-date e-waste recycling programmes information.	
	SMM7	Social media advertising is a convenient source of e-waste recycling programmes information.	