

Retraction

Retracted: Factors Affecting Behaviours of Returning E-Waste to Reverse Logistics System in Thailand

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] T. Mookhamakkul, "Factors Affecting Behaviours of Returning E-Waste to Reverse Logistics System in Thailand," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 5307662, 11 pages, 2022.

Research Article

Factors Affecting Behaviours of Returning E-Waste to Reverse Logistics System in Thailand

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This study investigates the behaviour for e-waste return using theory of planned behaviour (TPB). The factors influencing intention and behaviour are explored when it comes to e-waste returns in Thailand. We included attitude, social norms, perceived behavioural control, incentives, intention, and behaviour as additional variables in the model. A survey was used to collect a sample of 412 people, and the data were statistically evaluated using structural equation modeling (SEM). Intention was not really found to be significantly associated to subjective norms. However, the relationship between incentives and return intention was found out. Intention to return and behaviour of e-waste return were also found to have a substantial positive association. The findings have aided in determining the relative magnitude of variables of intention for e-waste return that lead to returning behaviour.

1. Introduction

Because of resource shortages, environmental constraints, and economic difficulty, businesses are presently questioned in internationally competitive markets [1]. Customers are also becoming more selective when it comes to environmental and social issues [2]. Furthermore, when it comes to accepting responsibility for end of life cycle, corporations must consider government environmental laws. Environmental restrictions include the Waste Electrical and Electronic Equipment (WEEE) Directive and the Regulation of the use of Certain Hazardous Substances Directive (RoHS) [3]. RoHS was implemented in the European Union with the goal of banning the hazardous substances in the product, whereas the WEEE Directive focuses on managing waste dumping and contributing to resource efficiency through reuse, recycling, and refurbishment [3]. As a result of these key problems, businesses are being forced to pay more attention to inverted supply chain management. The phrases reverse logistics and reverse supply chains are used interchangeably in some literature [4]. A reverse supply chain entails a series of actions aimed at reusing, recycling, or cor-

rectly disposing of a used product obtained from a consumer.

Reverse logistics refers to any logistics activities that convert discarded products which are no longer required by the consumer into products that can be resold or disposed of in an environmentally friendly manner. Because e-waste contains valuable metals, reverse logistics also includes material recovery. Although producers can set up their own reverse logistics networks, studies such as those conducted by [5] have explored additional recovery options. Their research included the utilization of third-party vendors. This will allow companies to concentrate on their core business functions, such as manufacturing items, but they may lose control over costs. Third-party providers have traditionally been employed for forward logistics, but [5] present a framework that outlines the actions that must be taken for a third-party provider to approach reverse logistics. This reverse logistics operation may be sufficient for reuse and remanufacturing because the producer is familiar with its own products and will learn how to remanufacture or reuse the retrieved products. However, if particular materials are to be recovered during recycling, the producer may not be

competent to undertake the task because their expertise and major business function may merely be creating things rather than removing recoverable materials from their products [6].

The usage of pooled group take back is another approach for completing reverse logistics. This can be accomplished by organizing groups of enterprises that produce similar items to invest in and build reverse logistics infrastructure for product recovery. Some studies, such as those conducted by [7], covered all three alternatives (including the producer take back). Their debates were solely descriptive and qualitative in nature. This would make it very difficult for manufacturers to figure out which option is the most cost-effective. To choose among the three possibilities, they would require a more quantitative instrument. Analytic network process (ANP) and balanced scorecard were utilized by [7] to evaluate these options. They were able to include corporate citizenship and environmental considerations into the decision-making process here. They were able to provide a better quantitative technique to selecting an option, but they were unable to build the network. It was noted that the research cited does not demonstrate whether a combination of recovery options is practicable. According to the discussion, only one choice can be used at a time. However, if one option's capacity is insufficient to meet treatment requirements or the demand for recovered material from producers, other choices should be made available. Because it may not be practical to examine the various combinations of alternatives in reality, a model is required, especially when network architecture is involved. It would be too expensive to simply start and close facilities on an experimental basis in real life.

Reverse supply chains are one of the most important ways for interorganizational adoption of circular economy ideas. A closed-loop supply chain, which involved both forward logistics and reverse logistics including product and information movements to produce a continual flow of products, also includes a reverse supply chain. A number of researches have looked into the impact of attitudes, social norms, perceived behavioural control, incentives, and trust on the willingness to return e-waste goods [8]. According to [9], two theories that characterise consumer behaviour are the theory of reasoned action (TRA) and the theory of planned behaviour (TPB). The theory of planned behaviour explains both behavioural intention and actual conduct, whereas the theory of reasoned action predicts any behavioural intention [10].

Furthermore, such ideas back up the idea that the desire of buyers to return e-waste products, as well as their underlying motivation, can be categorised as the reverse supply chain. With this in mind, the purpose of this study is to investigate whether TPB variables, as well as incentives [10–12], have a bigger impact on the desire to reverse the supply chain on returning e-waste items, as well as the price variable. By explaining the elements that influence e-waste return behaviour in Thailand, the study adds to the current body of information. We also test an extended model of planned behaviour that includes incentives, intention [10, 11, 13], and behaviour [9] to better understand e-waste

return behaviour in Thailand and identify a slew of other factors that influence end-user recycling adoption, such as economic returns, convenience, peer and family support, moral standards, social standards, environmental responsibility, encouragement, skill, and opportunity.

2. Theoretical Model and Hypothesis Development

2.1. E-Waste Concerns. Currently, in corporate environment, with a competing electronics industry, electronic equipment output is rapidly increasing since purchasers like to own the most recent model with more improved functionalities and appealing designs. As a result, e-waste production is rapidly increasing, reaching 41.8 million tonnes (mt) in 2014 [3]. In 2021, e-waste production is expected to reach 52 million tonnes, or 6.8 kilograms per person. Officially collected and recycled e-waste accounts for roughly 20% of total e-waste [14]. E-waste is defined as any electrical or electronic equipment, as well as their components, that has been abandoned as garbage by the owner with no intention of being reused [11]. Six major categories of electronic waste include large devices, tiny devices, smaller IT and telecom equipment, thermal exchange equipment, lights, and displays and monitors. The quantity of each category produced, as well as the number of instances of each category. Each category has its own set of functions and substances that, if not managed and treated properly, can have a variety of negative consequences for the environment and human health. Exporting e-waste to developing nations is forbidden in wealthier countries. In certain developing countries, illegal practices are wreaking havoc on people's health and environment. Due to a lack of effective treatment options, landfills are the final stage of a substantial quantity of e-waste, posing a hazard to the environment and society [15].

Several states in the US have undertaken several initiatives to gather and recycle e-waste produced by individuals and corporations. In California, for example, a law was passed mandating consumers to pay ARFs (advanced recycling fees) when they purchase appliances. The ARFs cost between \$6 and \$10 to aggregate monitors, televisions, and computers [16]. In 2006, Washington passed the Electronic Product Recycling Law. The goal of this law is to compel computer and television manufacturers to provide a free recycling system for residents, local companies, governments, charitable organisations, and schools throughout the state. Furthermore, over 800 local communities have started e-waste collection operations, which play an important role in e-waste management in private households [17]. In the United States, e-waste collection methods comprise curbside collections, drop-off stations, continuous fall, and takeback and buy facilities [18]. Even if they are now limited in their e-waste management capabilities in the United States, all states and large enterprises play an important role in long-term growth [17]. To get at an inefficient solution, the government should develop a regulatory framework in collaboration with corporate techniques.

Despite the creation and implementation of various e-waste laws in Southeast Asian countries, e-waste

management is still a long way off [19]. E-waste rules are almost complete in Thailand, Indonesia, and Malaysia [20]. If properly processed, e-waste can give enormous benefits to urban mining, including the recovery of precious metals. As a result, dealing with e-waste is a major task for everyone concerned, including customers, electronic corporations, and governments. Reverse supply chains offer a way to improve the legal collection and recycling of electronic trash.

2.2. Reverse Logistics. Reverse supply chains are the operations required to return a discarded or end-of-life product from a consumer to upstream party. Although academics have used the phrases reverse supply chain and reverse logistics (RL) interchangeably in their research, there is a significant distinction between the two. Reverse supply chain has a larger reach than RL, according to [21]. The former is concerned with partner cooperation and coordination, as the latter is concerned with shipping, warehouse, and inventory control responsibilities. In a nutshell, RL is a part of the reverse supply chain. From a business standpoint, reverse supply chain operations necessitate a significant amount of investment, but they can deliver economic benefits and strategic value to firms [5]. Moreover, the transportation cost of reverse logistics may be higher than that of forward logistics [22].

Figure 1 depicts an e-waste return logistics system. Materials and supplies would be transferred to the following stage, reverse logistics, after the used products have been retrieved. Returning products to facilities for inspection, sorting, and disposition is part of this process. This business includes transport, inventory, and distribution processes. Majority of the overall cost of a reverse logistics operation is typically made up of transportation costs.

In some ways, a backward supply chain varies from a forward supply chain [21]. Forward supply chains prioritise cost cutting and profit maximisation over environmental controls, cost cutting, and profit maximisation, whereas reverse supply networks prioritise environmental controls, cost cutting, and profit maximisation. Delivering a new product to a client is considered the product's last disposition option in forward supply chains. However, in reverse supply chain systems, this decision is made based on characteristics of returned goods. Depending on their qualities, returns can be reused, repurposed, reprocessed, or discarded [23]. However, studies on which factors have a significant impact on customer behaviour intentions toward e-waste return items are scarce.

2.3. Theory of Planned Behaviour. The notion of planned behaviour, which is associated with the concept of reasoned action, links the beliefs of potential customers to their actions. People make logical, reasoned judgments to do certain acts based on the knowledge they have, according to both models [24, 25]. According to the theory, consumers' attitudes toward their actual behaviour are based on their subjective behavioural belief in the service or product, as well as their cognitive evaluation of the possible outcomes; these behaviours may be influenced by subjective norms obtained from the more objective requirements of the consumer's

faith in consumption and obedience motivation. Subjective norms are a form of perceived consumption behavioural control mechanism. People's behavioural intents and behaviours are shaped by subjective norms paired with consumer sentiments. Consumer attitudes can be considered as a positive or negative assessment of an individual's expression of activities [25]. This conceptual framework assesses the degree to which a consumer's behaviour is negatively or positively related to their purchasing intentions. Consumer attitudes were defined in this study by consumers' positive assessments of returned e-waste products.

The opinions of others, including family, colleagues, spouses, and teachers, have a significant impact on people's behaviour judgments. This study characterised customers' views on returning e-waste products in the face of public pressure as subjective norms, which resulted in support for or resistance to reverse logistics, which has a negative environmental impact. Higher intentions (motivations) are developed when consumers regard the proposed behaviour for an e-waste product or service as positive (attitude) and believe that this attitude is important to others for them to conduct the behaviour more effectively (subjective norm). Many studies have discovered a substantial relationship between customer attitudes, perceived behavioural norms, and actual purchasing behaviour [26]. The return intention, which is defined as an individual's behavioural ease or difficulty in doing the behaviour [27, 28], was enhanced with aspects of perceived behavioural control and rewards. All of the normative beliefs that are accessible are used to gauge perceived behavioural control. Consumers who have more information about e-waste return characteristics and, as a result, a higher perceived behavioural control are more likely to return e-waste goods. The direct antecedent of behaviour is intention, which is described as a signal that a person is ready to engage in a given act. The potential for consumers to return e-waste products was designated as intention in this research. Figure 2 depicts the basic foundation of the theory of planned behaviour.

2.4. Hypothesis and Model Development. The evolution of the logic variables or variables on the goal of the theory of planned behaviour model is discussed in detail (Figure 2). Individual and social advantages are characterised as the cognitive potential benefits of consumers' attitudes regarding returning e-waste products, among other arguments. Consumers can change their behavioural intention by changing their self needs, mindset, and mental physiology for an e-waste product that recycles to reduce harmful emissions. This research looked at the impact of the e-waste product paradigm change from profit maximisation to e-waste renovation through reverse logistics on the production of e-waste renovation. As a result, the following hypothesis could be a good place to start when it comes to changing people's minds about the dangers of e-waste [29].

In 1985, Ajzen introduced the TPB [30], claiming that a person's behavioural intention is influenced by their perceived behavioural control (PBC), attitude (AT), and subjective norm (SN). AT stands for the individual's reaction to the behaviour. It is a continuous evaluation of liking or

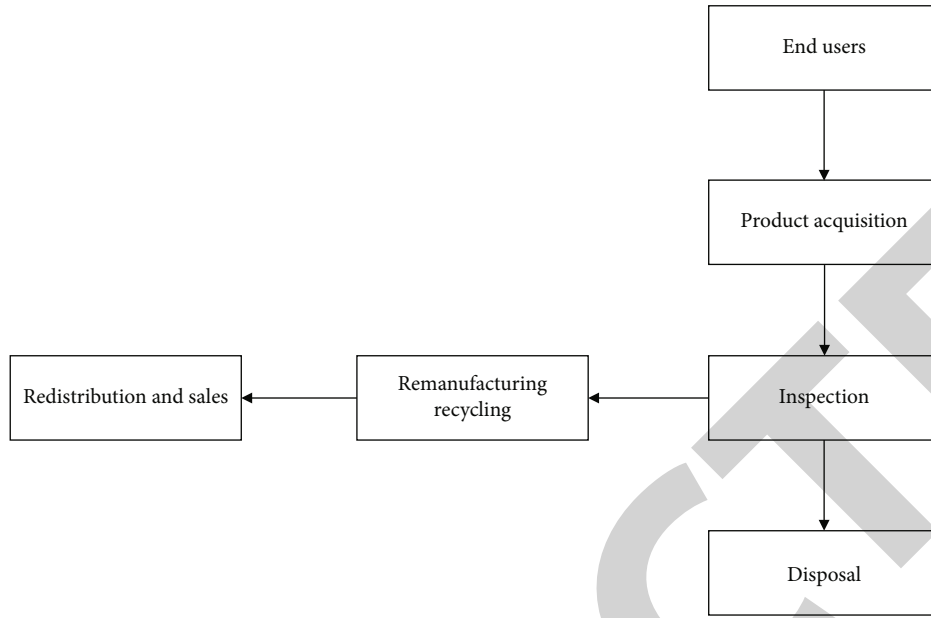


FIGURE 1: Reverse logistics system.

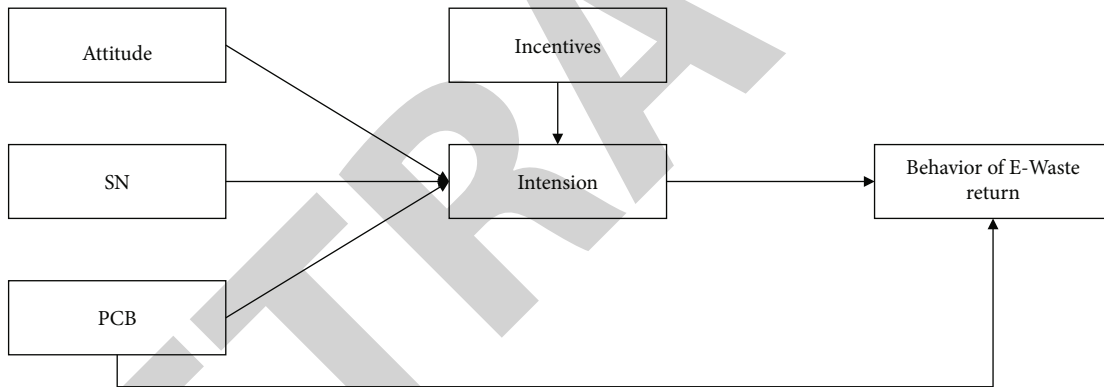


FIGURE 2: The conceptual framework for the study.

disliking for a certain action. According to the researchers, AT has the ability to predict potential behaviour. Reverse logistics was used to examine the antecedents of consumers’ behavioural intentions in the return of e-waste, and they discovered that AT has a favorable effect on customers’ intents [31]. TPB’s scope has been broadened to include customer perceptions of environmental sustainability [10]. This paper proposes the following starting hypothesis H1 based on the literature review.

Hypothesis 1. The intention to return e-waste is significantly influenced by one’s attitude.

The subjective norm (SN) is the second component of TPB, and it refers to the social stress that a person has committed to or not in order to do a specific action. Surrounding people, such as family, friends, and colleagues, can influence a behavioural intention, according to SN. Normative attitudes, social standards recognised by key reference groups, and a desire to act in accordance with those significant referents could all be examples of SN. SN has a good impact on

behavioural intention in an e-waste return, according to [31, 32] investigated the return of e-waste to the recycling process in reverse logistics and discovered that SN influenced behavioural intention. Based on the literature, this study establishes the second hypothesis, H2, and TPB.

Hypothesis 2. The intention to return e-waste is significantly influenced by subjective norm.

The third TPB component is perceived behavioural control (PBC), which relates to an individual’s view of their ability to control the essential resources and opportunities in their behaviour [10]. Other uncontrolled nonmotivational characteristics of people who have contributed to the regulation of individual behaviour include recycle service channel, concerns, expertise, wealth, talents, chances, capabilities, resources, or policies, in addition to personal desire and attempt. The two forms of PCB constraints are self-efficacy and external resources [27]. Self-efficacy refers to one’s faith in one’s ability to complete a task. The availability of resources and their amount of accessibility are known as

external resources. Both of these factors may influence an individual's decision to engage in certain behaviours [33] combined the TPB with another novel construct to investigate people's knowledge of an e-waste return and discovered that the PBC had a beneficial impact on the returning behavioural e-waste's intention. PBC has a positive influence reducing e-waste hazard contamination in the environment, according to [32] looked at the elements which encourage the implementation of green reverse logistics methods in Thailand's electronic industry, finding that mindset and PBC have a beneficial impact on behavioural intention. Another study looked at customer behaviour in Thailand in regard to returning e-waste for recycling, finding that attitude and PBC have a favorable impact on returning e-waste [33]. In TPB, the dependent construct is return intention (INT). Individuals' unique actions and the extent of real action are referred to as INT, and the variable explains and predicts actual intention to return e-waste. As a result, we can go on to the following hypothesis H3.

Hypothesis 3. The intention to return e-waste is significantly influenced by perceived behavioural control.

Incentives (INCT) have a considerable favorable influence e-waste return intention [34]. An additional reward or inducement that motivates people to return e-waste is known as an incentive. Financial incentives drive reducing waste, recycle, and other kinds of high-level waste treatment, which are all necessary for a resource-efficient circular economy [35]. Financial assistance or motivation, according to research, strengthens a company's internal skills and influences commitment to e-waste recycling and reverse logistics [36]. As a result, state subsidies and tax benefits, a higher price for e-waste commodities, and lower-cost recycled raw materials were all investigated as potential incentives in this study. The sincerity with which respondents see e-waste has an impact on their behaviour choice, which in turn has an impact on their consumption intention [37].

Hypothesis 4. The intention to return e-waste is significantly influenced by incentives.

With a high degree of accuracy, intention can be utilized to predict behaviour [30]. Numerous investigations have demonstrated the connection between purpose and genuine behaviour. Purpose has regarded to be a good predictor of conduct in the past; however, this is not always the case. This is known as the intention-behaviour gap, which was also validated in a study [38], which found that good intentions do not always lead to good action. Other researchers, on the other hand, have discovered a strong relationship between intention and behaviour. Researchers examining e-waste product return behaviour discovered a significant positive association between return intention and e-waste return behaviour [39]. Following the discussion, it is proposed that hypothesis H5.

Hypothesis 5. The behaviour to return e-waste is significantly influenced by intention. The behaviour of e-waste return goods is related positively to return intention.

According to the theory of planned conduct, there is a connection among perceived behavioural control and later return intention, where perceptions are defined as the subjective likelihood that an activity will result in specific consequences. Each outcome is evaluated based on the individual's subjective possibility that the activity will deliver the desired result [33, 40, 41]. PBC is a term that describes how a person's views of a particular activity are greatly influenced by the judgments of others. According to [30], perceived behavioural control is determined by the entire collection of return intents [42]. As a result, the options indicated below are available and proposed hypothesis H6.

Hypothesis 6. The intention to return e-waste is significantly influenced by perceived behavioural control.

The study model that is focused on these hypotheses and the idea of planned behaviour will be demonstrated in the next sessions.

3. Materials and Methods

3.1. Data Collection. In this research, the purchaser is the element of analysis. To gather data and verify the study framework that led to hypotheses, a questionnaire survey was used. The goal was to figure out what factors influence the behaviour of e-waste return items in Thailand. The questionnaire was given to a convenience sample of 412 people in Thailand, through a face-to-face survey. An uninformed respondent may struggle to comprehend the notion of sustainability, making it difficult to reply to questions about control on availability, perceived customer effectiveness, and other aspects of ecologically sustainable products [43]. The survey questionnaire was split down into different sections to measure all of the factors in this study. The demographic profile of the respondents was also recorded by the questionnaire. Before submitting the questionnaire to the respondents, it was discussed with several participants who had previously returned any e-waste products to see if there were any ambiguities in terms, meaning of things, and so on. They were also requested to complete the questionnaire's responses. As a result, the study's content validity was proved. There were 412 responses, for a response percentage of 100%. Because twelve respondents did not complete various sections of the questionnaire, their opinions were not really considered. As a result, the final number of completed replies for the survey was 213 female and 187 male respondents. Table 1 provides a demographic profile as well as descriptive statistics.

3.2. Instruments. The established validated scales for evaluating attitude, subjective norm, perceived control behaviour, return intention, and e-waste return behaviour were found in the current literature. The scales were based on consumer behaviour research that were concerned about the environment. On a 5-point Likert scale, 1 presented strong disagreement, and 5 presented strong agreement. In this study, the same scale was used because of the study's context. The authors utilized the scale in a study to investigate the

TABLE 1: Descriptive statistics.

Characteristics	Frequency	Percent	
Gender	Female	213	52.25%
	Male	187	46.75%
Age	Not more than 40	154	38.5%
	41-50	140	35%
	Above 50	106	26.5%
Education	High school or below	132	33%
	Bachelor	185	46.25%
	Master or high degree	83	20.75%

association between e-waste product return intentions, return decisions, and environmental consciousness [44].

3.3. Results. Structural equation modeling (SEM) using AMOS version 4.0 with maximum likelihood method was used to verify the study framework and hypotheses [45] recommended a two-stage model development procedure for employing SEM, which was implemented. AMOS version 4.0 was used to analyze the measurement and structural models. The research model covered attitude, subjective norm, perceived behavioural control, intention, behaviour, and incentives. Table 2 illustrated CFA result after eliminating items with a low loading value. Cronbach's alpha, greater than 0.6 [46], reflects consistency of factors studied. Composite reliability (CR), greater than 0.6 [47], represents the reliability of the model. To confirm the measurement's discrimination reliability, average variance extracted (AVE) was adopted. AVE's values are greater than 0.5 [48], but not perceived behavioural control. However, AVE that is less than 0.5 can be acceptable if CR is greater than 0.6 [48]. Moreover, 0.487 is close to 0.5, so the convergent validity can be established [49].

The Fornell-Larcker criterion was employed to determine the discriminant legitimacy of the model. The Fornell-Larcker criterion recommended that the square root of AVE of the construct being considered must be larger than the correlation between itself and other constructs in the model [49]. As seen in Table 3, the square root of AVE of all constructs is larger than the correlation between the constructs. The discriminant validity, therefore, is established. The measure model proved to be a good fit for a construction of a structural model (CMIN/df = 1.898, GFI = 0.943, AGFI = 0.915, NFI = 0.942, TLI = 0.961, CFI = 0.971, RMSEA = 0.047, and SRMR = 0.040).

Table 4 depicts the structural model. The fit indices illustrate that the model is acceptable fit (CMIN/df = 3.254, GFI = 0.908, AGFI = 0.873, NFI = 0.892, TLI = 0.903, CFI = 0.922, RMSEA = 0.075, and SRMR = 0.083). As shown in Table 4, attitude was positively and statistically significant related to return intention of e-waste products ($\beta = 0.28$, $p < 0.01$), subjective norm was not statistically significant related to return intention ($\beta = -0.02$, $p < 0.01$), perceived behavioural control was positively and statistically significant related to return intention ($\beta = 0.24$, $p < 0.001$), and incentives were positively and statistically significant related

to return intention ($\beta = 0.14$, $p < 0.01$). Return intention was positively and statistically significant related to e-waste return behaviour ($\beta = 0.53$, $p < 0.001$), and perceived behavioural control was positively and statistically significant related to e-waste return behaviour ($\beta = 0.14$, $p < 0.001$).

As a result, hypotheses H1, H3, H4, H5, and H6 were supported. The link between subjective norm and return intention for e-waste return goods (H2) was not supported and depicted in Figure 3.

4. Discussion and Implication

The goal of this research was to look into and track the factors that influence e-waste return intent and behaviour, as well as the relative strength of variables such attitude, subjective norm, and perceived behavioural control. This research also looked into the relation between incentives and the desire to recycle e-waste. The whole study was conducted within the context of the theory of planned behaviour [30] in order to comprehend the impact of numerous variables of e-waste product return intention in a single framework that eventually led to e-waste product return behaviour. The structural model's results show that the two models are well matched. In this study, the most important driver of the return intention for e-waste products was incentives and perceived behavioural control.

It was discovered that there is a favorable and significant link between attitude and the intention to return. It followed the expected pattern, according to the theoretical assumptions, and the results were equivalent to those obtained by [50], who investigated environmentally aware recycling behaviour using the theory of planned behaviour. Communication and educational activities are aimed at increasing awareness of environmental issues have proven successful in influencing people to behave in ways that are beneficial to the natural environment [51]. Subjective norm regarding e-waste items was found to be adversely correlated with the desire to return them. This conclusion also contradicts the findings of analogous connection studies by [41]. The subjective norm, also known as perceived social demand to do a specific activity, was revealed to be minimal and of extremely poor value in this study. Many researchers have stressed the fact that subjective norm has a much smaller impact in TPB [52]. According to these specialists, people who could reach the collective self proficiently were more crucial to the subjective norm. Interpersonal relationships with others, which are developed via both common and symbolic identification with a group, are essential to the collective self. People who are attached to in-group membership, such as proenvironmental advocacy groups, are more concerned about environmental concerns, and the effect of subjective norms on e-waste product return intention may be more noticeable in such situations. In a collectivistic culture like Thailand, it was also expected that subject norms would have a bigger influence on return intention than attitude. Despite the fact that this theory was not verified, a similar study conducted in Chinese culture, which is also collectivist in nature, found that subjective norm has a bigger impact than attitude [53]. It could be linked to the

TABLE 2: Factor loading (λ), Cronbach's α , AVE, and composite reliability.

Constructs	Items	λ	Cronbach's α	AVE	Composite reliability
Attitude	AT-1	0.771	0.841	0.576	0.843
	AT-2	0.871			
	AT-3	0.662			
	AT-4	0.723			
Subjective norm	SN-1	0.818	0.797	0.664	0.798
	SN-2	0.821			
Perceived control behaviour	PCB-1	0.559	0.635	0.487	0.647
	PCB-2	0.821			
Intention	INT-1	0.78	0.892	0.674	0.892
	INT-2	0.83			
	INT-3	0.87			
	INT-4	0.80			
Behaviour	BH-1	0.978	0.831	0.737	0.846
	BH-2	0.738			
Incentives	INCT-1	0.638	0.876	0.582	0.871
	INCT-2	0.571			
	INCT-3	0.871			
	INCT-4	0.888			
	INCT-5	0.818			

TABLE 3: Discriminant validity.

	INCT	BEH	INT	PBC	SN	AT
INCT	0.763					
BEH	0.301	0.858				
INT	0.439	0.584	0.821			
PBC	0.377	0.421	0.607	0.698		
SN	0.102	0.280	0.209	0.206	0.815	
AT	0.352	0.488	0.579	0.366	0.127	0.759

study's participants' lack of access to the collective self, as well as the blurry border between collectivism and individualism in Thai society. A questionnaire was done in a private context in which respondents did not reveal their real self-revealed a low and inconsequential estimate of subjective norm, which could be related to an underestimation of this construct. The moral or personal norm could be a useful concept in place of the subjective standard. A personal standard is the expression of an individual's proclamation regarding the validity of acting in a certain way. Subjective norms can be thought of as a set of standards or a sense of moral obligation. Ethical norms have been regarded as an internalized version of social standards, and research suggests that there is a link between this and environmentally sensitive conduct [27]. In ethically oriented contexts, using a moral standard instead of a subjective norm may increase the TPB framework's ability to explain behaviour [10, 54].

The association between perceived behaviour control, such as recycling, and barriers to returning e-waste items have an affirmative and substantial relation with e-waste product return intention. The findings are consistent with

previous study on proenvironmental behaviour by scholars [44]. Overall, the model, which was based on the theory of planned behaviour, offered useful insight into the purpose and behaviour of e-waste return for products in a cost-effective and satisfactory means in a developing country like Thailand. Although the effect of environmental awareness on attitudes toward e-waste concerns has been studied in other countries, little research has been done in Thailand [50]. This is also considered in the current investigation.

The findings of this study have a number of significant consequences. First and foremost, the study could assess the legitimacy of the TPB model for e-waste re-research in diverse geographies, cultural situations, and behavioural characteristics. The findings of this study have provided important e-waste information on the prerequisite of return intention that leads to e-waste return product behaviour in Thailand. These findings can assist policymakers and marketers in formulating policies that will increase customer return intentions and behaviour toward e-waste products which are consistent with [55]. It is critical for policymakers seeking to improve the environment to comprehend the behavioural components of consumption in order to persuade individuals to change and believe in specific aspects of their behaviour, resulting in improved environmental and ecological conditions.

Government and marketers will decide on a strategy or campaign to encourage returning electrical appliance waste to the recycling process based on the findings of empirical analysis. Good, beneficial, sensible, and rewarding things have an effect on return intention through attitude. Furthermore, knowledge and problems have a considerable influence on return intention indication via perceived behavioural control. Consider, plan, intend, and willing

TABLE 4: Summary of the structural model.

Path description	Hypothesis	Unstandardized path estimates	Test results
Attitude → return intention	H1	0.28**	Supported
Subjective norm → return intention	H2	-0.02	Not supported
Perceived control behaviour → return intention	H3	0.24**	Supported
Incentives → return intention	H4	0.14*	Supported
Return intention → behaviour of e-waste return	H5	0.53**	Supported
Perceived Behavioural control → behaviour of e-waste return	H6	0.14*	Supported

$\chi^2 = 389.479$, $df = 218$, $GFI = 0.908$, $AGFI = 0.873$, $CFI = 0.922$, $IFI = 0.929$, $TLI = 0.903$, $RMSEA = 0.075$, $SRMR = 0.083$, $*p < 0.01$, and $**p < 0.001$.

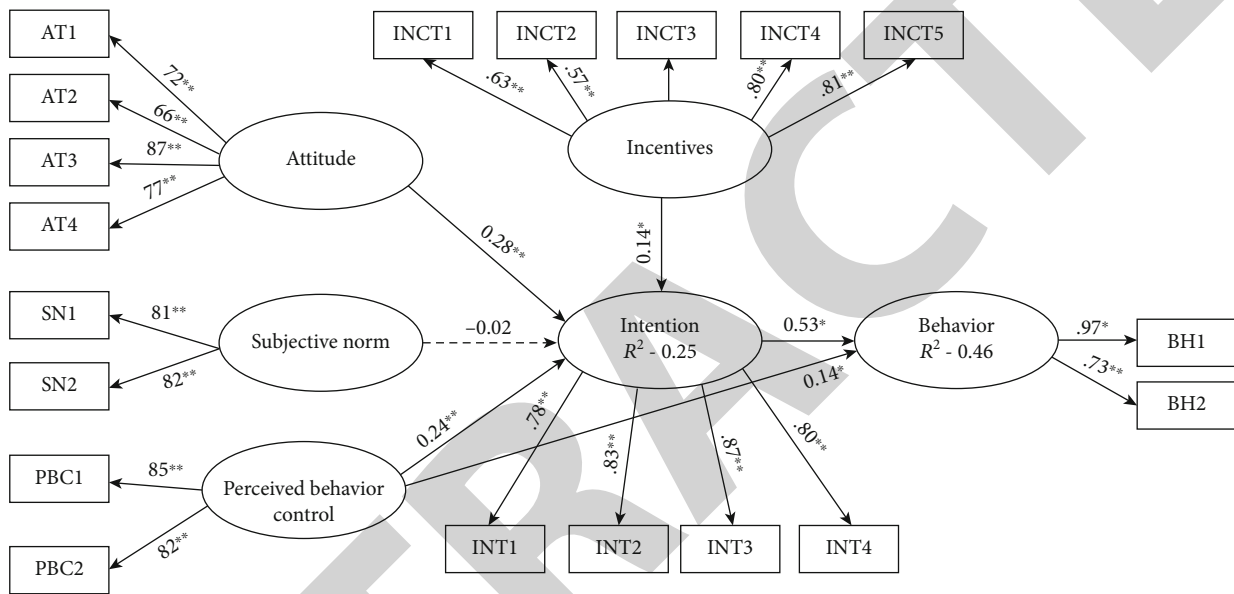


FIGURE 3: Result of the structural model.

things all have an impact on e-waste product return intentions. People are encouraged to return electrical items when they have expired, broken down, defected, or are no longer in use so that they can be recycled by the government. It should also take the time to provide personal information and product information to customers at the point of return, such as kind, price, and reason for return, among other things. Return intention is influenced by behaviour construct components such as complying promptly without conditions and reluctantly. Through the incentives construct, feedback, descriptive social norms, injunctive norms, framing, and goal setting have direct effects on intention. However, the findings demonstrated that the subjective standards' position as a mediator is ineffective. As a result, instead of regulating or encouraging subsidies, the government should allow consumers to freely share their experiences and knowledge via social media.

The marketing landscape is rapidly changing as more and more attention is devoted to topics such as proenvironmental behaviour. Relevant challenges such as climate change, harmful materials pouring into the environment, and others are posing a danger to sustainable development, with far-reaching implications for the global socioeconomic

landscape. As a result, an increasing number of consumers are projected to switch to returning electronic trash items that are eco-friendly. It is critical for reverse logistics marketers to integrate the factor of sustainability in their marketing plan at this time. The current study will aid them in better understanding one of the most critical aspects of reverse logistics: consumer behaviour. For a collectivistic society like Thailand, findings like the absence of impact of subjective norms on return intention may be unique; as a result, reverse logistics may need to shift the focus style of managing logistics activities that are purely centered on Thailand's collectivistic nature.

Managing knowledge has a large and beneficial impact on the attitude toward e-waste product return intentions, according to reverse logistics systems [56]. It helps them to tailor their communication material to the needs of their target audience in order to improve their knowledge level. There is always a question about the veracity of the government's claims about e-waste items. The anxiety is heightened in the lack of relevant communication that confirms the claim's authenticity. According to the conclusions of this study, having the proper set of information will have a good impact on consumers' attitudes. It is also worth mentioning

that the sense of incentive or punishment has an impact on characteristics like perceived consumer effectiveness and that government efforts focused at encouraging e-waste recycling are viewed more favorably than those aimed at diminishing the appeal of ecologically hazardous conduct. As a result, when developing plans for e-waste goods, the government or policymakers must consider the concept of perceived behavioural control.

5. Conclusion

In conclusion, the purpose of this research was to examine the factors influencing e-waste return intent and behaviour from the theory of planned behaviour. The incentive was additional to extend the model. The structural equation model was used to analyze the causal relations. The study showed that intention was attributable to attitude, perceived behaviour control, and incentive, while subjective norms did not significantly influence the intention. The relationship between perceived behaviour control and behaviour of returning e-waste was found to be significantly positive. According to the conclusions of this study, having the proper set of information will have a good impact on consumers' attitudes. The government or policymakers must consider the concept of perceived behavioural control. The findings in this paper are consistent with both the theoretical background and popular opinion on the subject. Despite this, there are a few weaknesses in the current study. Because the study was limited to a few main cities in Thailand, and thus to restricted geography, it is probable that it did not cover all of the required biological diversity on a bigger scale. Despite this limitation, given the range and representativeness of the sample used in the study, the findings are incredibly helpful in increasing our understanding of customer return behaviour for e-waste products in Thailand. Future research should look into these variables. The current study focused on components from the theory of planned behaviour, as well as constructs like e-waste concerns understanding and perceived consumer efficacy. Future research should investigate the role of a variety of other relevant constructs, such as participation, trust, and values, which could operate as a moderator or mediator between the model's various elements. Because environmental and recycling process concerns are a major policy issue on a worldwide scale, it is prudent to investigate the impact of environmental regulation in the model as a moderator of return behaviour.

Data Availability

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

Conflicts of Interest

The author declares no conflict of interest.

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