

# The Impact of Consumers' Perceptions and Reference Groups on Consumers' Behavioral Intention Towards Electronic Products and The Electronic Waste Problem

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## Abstract

This study aims to investigate the development of a causal relationship model incorporating the three latent variables, which are consumers' perceptions of e-goods and the e-waste problem, reference group influence, and consumers' behavioral intention. The research employed a quantitative approach to gather data in Thailand for enterprises that are associated with personal computers and mobile phones market segment of electronic product industry. An online survey approach using a self-administered questionnaire as a research tool was implemented. Researchers conducted a path analysis with latent variables by employing the structural equation modeling (SEM) to analyze the data through AMOS version 24. The findings suggest that the development of a causal relationship model indicated quite good congruence with empirical data. In addition, consumers' perceptions and reference group appear to be potential determinants and play a role in influencing consumers' behavioral intention in the aspects of product utilization and word-of-mouth.

**Keywords:** Perception, Reference Group, Behavioral Intention, Electronic Products, Electronic Waste

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## Introduction

Green ocean strategies implemented through corporate social responsibility (CSR) initiatives not only encourage consumers to react to enterprises in a positive way, thereby maintaining an existing customer base (Vlachos et al., 2009, pp.170-180), but can also positively motivate consumer behavior in purchase decision-making of specific products (Vongmahasetha, 2016, pp.137-147). Conversely, any negative media attention can be detrimental to corporate image and reputation, ultimately affecting sales of products and services. Many global enterprises have embraced environmental marketing strategies, including 'The Body Shop's project, namely, Bio-Bridges Mission' (Future-Fit Business, 2025) and 'Forever Against Animal Testing with Cruelty-Free Beauty' (Kotler & Lee, 2005, pp.68), as well as 'Fuji Xerox eco-campaign, You Print, We Plant' (Eco-Business, 2025).

In the current social era of the digital economy, there is an increasing realization of the chronic electronic waste (e-waste) problem, and as a result many organizations are participating in the 'Solving the E-Waste Problem (or StEP) Project' to reuse and recycle electronic goods. This includes many global firms, such as Microsoft Corporation, Ericsson Company, Hewlett-Packard (HP), and Dell, Inc. (Step-initiative, 2025).

In Thailand, the impact of e-waste is ranked the most serious environmental problems (TDRI, 2016) including drought and water shortages, population encroachment into forested areas, and coastal erosion. The reason for Thailand's e-waste problem could be attributed to its position as a newly-industrialized country. The ranking of the e-waste problem as the most serious issue indicates that almost everyone in Thailand (e.g., electronic firms, entrepreneurs, marketers, consumers) does not have a good understanding of e-goods and lacks proper e-waste management.

The growth in revenue of consumer electronics (e.g., smartphones, laptops, personal computers [PCs], tablets, televisions) has been increasing in Thailand since 2013 and peaked in 2016 (Statista Research Department, 2025). Like the rest of the world, corporations in Thailand, especially the electronic goods industry, recognize and are concerned about the e-waste problem, and see this as an opportunity, not only to increase their competitiveness through environmental marketing strategies, but also to adopt this social cause. 'Six social initiatives include: cause promotions, cause-related marketing, corporate social marketing, corporate philanthropy, community volunteering, and socially responsible business practices' (Kotler & Lee, 2005, p.23). Therefore, in order for an electronic company in Thailand to create a competitive edge, the effective implementation of an environmental marketing strategy that considers e-waste is necessary. This relies on an insight into consumer behavior that importantly focuses on consumers' perceptions of e-goods, and the e-waste problem, and behavioral intentions (Chaweasuk & Wongjaturapatra, 2012, p.2) in purchasing and using electronic goods technology.



In this study, we make use of ‘technology acceptance theories and the concepts of the Model of PC Utilization (MPCU)’ (Thompson, Higgins, & Howell, 1991, p.131) in combination with the ‘Theory of Planned Behavior (TPB)’ (Ajzen, 1985, pp.11-39). We also applied marketing and consumer behavioral concepts that focus on consumers’ perceptions of e-goods and the e-waste problem and behavioral intention regarding product utilization, including word-of-mouth behavior. As a result, a causal relationship model was formulated with respect to three latent variables: (1) consumers’ perceptions of e-goods and the e-waste problem (perception), (2) reference group influence (reference), which derived from MPCU theory, and (3) consumers’ behavioral intention (intention). This research examines how perception and reference group influence may play a potential role in affecting behavioral intention within a specific electronic product category (PCs and mobile phones).

Therefore, our contribution to the literature appears to be in the field of technology acceptance studies (e.g., MPCU and TPB), consumer behavior research (e.g., consumers’ perception and consumers’ behavioral intention), and green ocean marketing strategies in a newly industrialized country.

The product choices for this study were PCs and mobile phones; technology acceptance theories were incorporated together with marketing theories for the development model to better understand consumers’ perceptions of e-goods and the e-waste problem.

The reference group also incorporated other groups, apart from the primary group, including aspirational groups and membership groups, thereby extending the observation of reference group influence (Sareerat et al., 2000, p.83). The study looked at the membership groups consisting of (1) traditional social group influence (e.g., TV, radio, associations, organizations, foundations, confederations, and clubs) and (2) modern social group influence (e.g., social media and other digital platforms). To examine these two channels would encourage us to better understand consumer behavior and the increasing role of modern social group influence due to the shift towards digital transformation in the economy, society, and marketing.

Previous research has not explored consumers’ behavioral intention regarding the incorporation of word-of-mouth behavior and product utilization aspects. The MPCU theory suggests that social factors, such as the reference group, have an impact on the utilization of PCs (Thompson, Higgins, & Howell, 1991, p.126). A previous study also found that consumers’ perceptions and reference groups could impact consumers’ behaviors by word-of-mouth (Warotwattananon, 2015, pp.86-100) Thus, this work is also anticipated to apply and focus on the roles of word-of-mouth and product utilization in how they would act as indicators for behavioral intention and play the potential roles in driving consumers to show off their behavioral intention or behavior (Confente, 2015, pp.613-624; Palachai, 2015, pp.1-93).



These findings show that perception and reference group influences can explain behavioral intention with respect to product utilization including word-of-mouth behavior. As well as contributing to academic knowledge, these findings have the potential to benefit organizations, including non-profit organizations, the private business sector and the government sector, as well as e-good producers (in particular, PC and mobile phone manufacturers), as part of an outcomes database. Additionally, based on the widespread facts, consumers increasingly focus on the environment and are changing their behavior (Shil, 2012, p.76). Thus, the outcomes of this study can be used to make recommendations to marketers/managers and entrepreneurs on how to better apply and implement these findings into their environmental marketing strategies, as well as how to better approach target markets in order to increase their competitiveness.

## Research Objectives

Our research aims to examine the development of a causal relationship model among consumers' perceptions of e-goods and the e-waste problem, reference group influence, and behavioral intentions, with emphasis on PCs and mobile phones. These findings should demonstrate agreement with previous empirical data from the electronic products industry. The research also aims to:

- (1) Examine the influence of the perception factor with respect to e-goods and the e-waste problem on consumers' behavioral intention with respect to electronic product use and word-of-mouth behavior.
- (2) Explore the reference group influence on consumers' behavioral intention with respect to electronic product use and word-of-mouth behavior.
- (3) Investigate whether the reference group influence mediates the influence of consumers' perceptions of e-goods and the e-waste problem on consumers' behavioral intention with respect to electronic product use and word-of-mouth behavior.

## Scope of the Research

Quantitative data were collected through an online survey using a self-administered questionnaire, which is specifically designed for respondents to complete by themselves without assistance. Consumers were adult men and women living in five provinces in Thailand, namely, Chiang Mai, Khon Kaen, Ubon Ratchathani, Nakhon Ratchasima, and Bangkok. These five provinces generate the highest volume of e-waste per year, and consumers were representative of the study population of these five provinces (National Statistical Office Thailand, 2019).

## Conceptual Framework

The conceptual framework for the study was developed from the MPCU theory (Thompson, Higgins, & Howell, 1991, p.131), which is an appropriate method to study prediction of individual technology acceptance. The Model of PC Utilization theory and the theory of TPB (Ajzen, 1985, pp.11-39) were applied, together with marketing concepts and consumer behavioral theories that focused on consumers' perceptions of e-goods, the e-waste problem, and behavioral intentions. As individuals express their behavior in accordance with their understanding or perception, the conceptual framework in this study is anticipated to clarify which determinants influence consumers' behavioral intention with respect to product utilization and word-of-mouth behavior for particular products, such as PCs and mobile phones. The conceptual framework was proposed as follows (Figure 1).

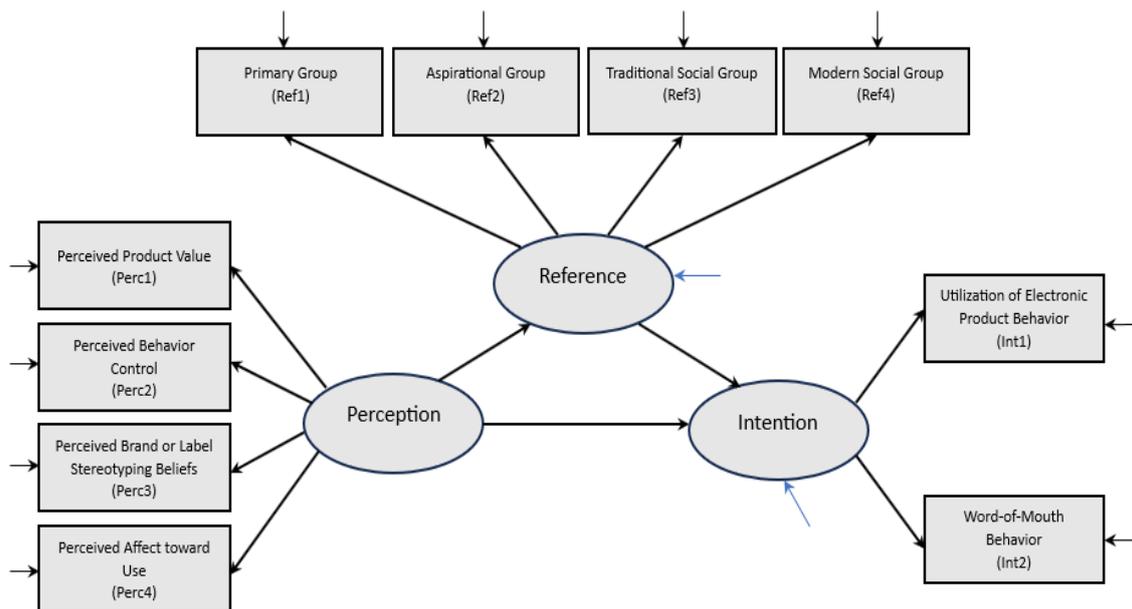


Figure 1 Conceptual Framework

### Research Hypotheses

**Hypothesis 1 (H1):** The development of a causal relationship model among consumers' perceptions of e-goods and the e-waste problem, reference group influence, and behavioral intentions indicates a congruence with empirical data.

**Hypothesis 2 (H2):** The perception factor with respect to e-goods and the e-waste problem positively influences consumers' behavioral intention for electronic product utilization and word-of-mouth behavior.

**Hypothesis 3 (H3):** The reference group positively influences consumers' behavioral intention with respect to electronic product utilization and word-of-mouth behavior.



**Hypothesis 4 (H4):** The reference group influence mediates the influence of consumers' perceptions of e-goods and the e-waste problem on consumers' behavioral intention with respect to electronic product utilization and word-of-mouth behavior.

## Literature Review

### Consumers' perceptions

Individual consumers have various perceptions towards a specific product; this is due to differences in individual brand beliefs, experiences, or cultures. If a particular product is perceived in a positive way, there is an opportunity to sell that product, irrespective of the quality of that particular product. The influence of perception creates an attitude towards something (Zimbardo, Ebbesen, & Maslach, 1977, pp.1-271), and a positive feeling creates a positive attitude towards behavioral intention (Chaweasuk & Wongjaturapatra, 2012, p.2). Chiou (1998, pp.298-308) states that perception has a direct positive relationship towards behavioral intention with respect to purchasing, or use of a particular product. Warotwattananon (2015, pp.86-100) also suggests that perceived product value could have a direct positive effect on consumers' word-of-mouth behavior. Previous research highlights that the perception determinant – product quality perception – can have a positive indirect impact on consumers' purchasing behavior (Chokenukul, Sukhabot, & Rinthaisong, 2019, p.366). There are four indicators for the perception determinant.

### *Perceived product value*

This criterion was developed from marketing concepts with respect to perceived value incorporated within the MPCU theory. The elements of this perception factor would, therefore, considered to be quality, long-term consequences, job-fit, complexity, and facilitation. These factors are drivers in influencing consumers' behavior in purchasing or utilizing a specific product (Chokenukul, Sukhabot, & Rinthaisong, 2019, p.366; Thompson, Higgins, & Howell, 1991, pp.131). Previous studies have also asserted that perceived value identifies a positive relationship to product value evaluation, and consumers' behavioral intention to purchase or use a particular product (Chen & Chen, 2010, pp.29-35; Petrick & Backman, 2002, pp.38-45; Tarn, 2008, pp.31-43; Dodds, Monroe, & Grewal, 1991, pp.307-319).

### *Perceived behavior control*

This indicator was explicated from the TPB concept and makes the point that perceived behavior control can directly influence consumers' behavioral intention (Ajzen, 1991, pp.179-211).



### ***Perceived brand or label stereotyping beliefs***

This element of the perception determinant was derived from the TPB theory, and explains that attitude towards behavior appears to directly influence consumers' behavioral intention (Ajzen, 1991, pp.179-211). Attitude or belief can influence individuals' positive or negative feelings towards a specific product or brand (Sareerat et al., 2000, pp.78)

### ***Perceived affect towards use***

This criterion was developed from the MPCU theory, and this indicator directly influences consumers' use of PCs (Thompson, Higgins, & Howell, 1991, p.131).

### **Reference Group Influence**

The reference group influence, or reference factor is associated with social influence or social factors and was developed from the MPCU theory. This theory considered participants' families, friends, and leaders as the reference group (Thompson, Higgins, & Howell, 1991, pp.126). However, as reference group influence in the marketplace can vary, further considerations were made for an appropriate reference group in this study. The measurement criteria for the reference factor were incorporated (Kotler, 2000, p.163; Sareerat et al., 2000, p.83) and described as the following group influences:

***Primary group influence*** (e.g., family, relatives, friends, leaders, and colleagues).

***Aspirational group influence*** (e.g., celebrities, singers, politicians, and other famous people).

***Membership of traditional social group influence*** (e.g., TV network personalities, radio network personalities, and members of associations).

***Membership of modern social group influence*** (e.g., members of online social groups, and other social networks).

Previous studies have indicated that social factors, such as the reference group directly influence consumers' utilization of PCs (Thompson, Higgins, & Howell, 1991, p.127). Moreover, Verlegh & Candel (1999, pp.457-464) found that the reference group had a positive relationship with, and strongly affected, consumers' behavioral intention in reusing a product, or retaining purchases. Verlegh & Candel (1999, pp.457-464) also found that primary group influence appeared to have a superior impact on consumers' behavioral intention compared to other groups. Furthermore, Ajzen (2002, pp.665-683) stated that the reference group can create influence that affects individuals' action or behavior. Chiou (1998, pp.298-308) confirms that the reference group has a positive relationship with consumers' behavioral intention in purchasing or using a product.

Another point of view is provided by Samitthikrai (2011, p.321) who identified that consumers who lacked sufficient knowledge or information associated with a particular product have less confidence when it comes to purchasing or using a specific product. Here, the reference group would play a potential role in affecting consumer choice. Therefore, it is



reasonable to assume that the reference group determinant could be a mediator that encourages consumers to become more knowledgeable about a product, thereby influencing their behavioral intention.

To advocate the previous statement, studies on consumers' perceptions found that perception had an indirect effect influencing consumer behavior. For instance, there is evidence from a previous study asserts that perception factor with respect to consumers' perceptions of product quality information demonstrated a positive indirect effect on consumer behavior in purchasing (Chokenukul, Sukhabot, & Rinthaisong, 2019, p.366).

As a consequence, we developed the conceptual framework for the study by defining the reference group determinant as the mediator between consumers' perceptions of e-goods and the e-waste problem, and behavioral intention factors. This model, which has been developed, is anticipated to clarify, whether reference group influence can mediate the perception factor and thereby indirectly affect consumers' behavioral intention.

### **Consumers' behavioral intention**

Behavioral intention is a dependent determinant in this study, and has been incorporated into the development model from technology acceptance theories. Since the factor with respect to consumers' actual use behavior is deemed difficult to observe, we aim to study two aspects of behavioral intention:

#### ***Utilization behavior of electronic products***

***Word-of-mouth behavior*** focusing on a particular brand, eco-friendly labelling, or a corporate name associated with social and environmental responsibility.

The two components of the behavioral intention determinant have been developed from the concepts of Thompson, Higgins, & Howell (1991, pp.131) who investigated consumers' utilization of PCs, and Warotwattananon (2015, pp.86-100), who found that perceived product value appeared to influence consumers to express their behaviors through word-of-mouth. Warotwattananon (2015, pp.86-100) revealed that the influencer factor (or reference group influence) had a relationship and could play a salient role in affecting consumers' word-of-mouth behavior.

Based on a literature review (Warotwattananon, 2015, pp.86-100; Chiou, 1998, pp.298-308; Ajzen, 1991, pp.179-211; Thompson, Higgins, & Howell, 1991, p.131; Ajzen, 1985, pp.11-39), we formulated the conceptual framework for this research (as shown in Figure 1) to examine the role of perception and reference factors in behavioral intention, particularly for the product categories of PCs and mobile phones. Taking into consideration the indirect positive effect of perception on consumer behavior (Chokenukul, Sukhabot, & Rinthaisong, 2019, p.366), we also examined whether the perception factor had an indirect effect on consumers' behavioral intention through reference group influence.



## Methodology

### Population and sample size

The population size for the study was derived from the total population of five provinces. These five provinces were defined as the study population based on information from a global e-waste surveillance report, which indicated that the average Thai generates 7.4 kilograms of e-waste per year. (GreenNews, 2018; Environmental and Pollution Control Office 13, 2018; The Standard, 2018). Population sizes for the five provinces include: Bangkok (5,676,648 people), Nakhon Ratchasima (2,646,401 people), Ubon Ratchathani (1,874,548 people), Khon Kaen (1,805,895 people), and Chiang Mai (1,763,742 people) (National Statistical Office Thailand, 2019), which equates to a total population size of 13,767,234 people. Another reason for choosing these five provinces is that these provinces are economically prosperous regions, popular with tourists, and e-waste sorting communities are distributed within these areas (The Standard, 2018).

The sample size was obtained by applying Taro Yamane's formula for finite population (Zikmund & Babin, 2015, pp.1-494; Sareerat et al., 2006, pp.1-328). A minimum sample size of 400 participants was obtained (95% confidence level with a 5% margin of error). Schumacker & Lomax (2016, pp.39) suggested that a suitable sample size for analyzing data using structural equation modeling should range from 250 to 500 participants. Considering these considerations, the sample size of 400 participants for this study was deemed sufficient.

### Research tool

An online, self-administered questionnaire, which allow participants to complete it without assistance, was implemented as a research tool for gathering data. The questionnaire included closed-ended questions for evaluating consumers' perceptions of e-goods and the e-waste problem, reference group influence, and behavioral intention using an interval scale from 1 to 5 (Likert scale) for measurement.

Item-Objective Congruence Index testing was carried out by three academic experts, who evaluated whether the questionnaire content was suitable, and advised on any necessary improvements. An IOC greater than 0.5 indicates content validity for each specific question and reflects internal validity of a research instrument (Tapsai, 2015, pp.2544-2547). The results of IOC testing in this study showed that every question item had an IOC value between 0.67–1.00 confirming the content validity of this tool. A pre-test was then performed with 30 consumers in order to examine the instrument's quality.

In the pre-test (30 consumers), an internal consistency reliability test was conducted employing Cronbach's alpha coefficient ( $\alpha$ ) as a criterion for questions (scale measurement). The reliability of the entire questionnaire was 0.898 ( $p < .05$ ,  $n = 30$ ), which was greater than



the required Cronbach's alpha level of 0.70, thus confirming the reliability of the questionnaire (Bryman & Bell, 2015, pp.1-778; Hair et al., 2010, pp.1-785; George & Mallery, 2003, pp.1-386). Furthermore, the reliability testing of latent variables showed Cronbach's alpha values of 0.894 for overall perception, 0.863 for overall reference, and 0.832 for overall intention ( $p < .05$ ). As all three latent variables were greater than Cronbach's alpha level of 0.70, these latent variables were deemed reliable and appropriate for data collection (Bryman & Bell, 2015, pp.1-778; Hair et al., 2006, pp.1-899). All measurement criteria items for each latent variable were deemed to adequately capture the construct.

The discriminant index for question items was between 0.213–0.660, which was greater than the required value of 0.20 and therefore, asserted the appropriateness of the entire questionnaire (Tapsai, 2015, pp.2544-2547). In addition, the discriminant value of all question items used for measuring the three latent variables was between 0.327–0.782 for perception, 0.242–0.677 for reference, and 0.439–0.780 for intention. As all three latent determinants were greater than the discriminant value of 0.20, these latent variables were deemed appropriate to collect data (Tapsai, 2015, pp.2544-2547).

### **Data Collection**

To gather the data, a multi-stage sampling approach was used. Firstly, a probability sampling method utilized stratified random sampling to identify the five different strata population in the five Thai provinces. The members of each stratum were homogeneous (Zikmund & Babin, 2015, pp.1-494) and characterized as unisex consumers aged 18 years or over with experience in using and purchasing electronic products, in particular PCs and mobile phones.

A proportionate stratified sampling method was then used to identify the sample number required for each of the five consumer groups in the five provinces. An online survey questionnaire was distributed to 450 adults to obtain completed questionnaires from 400 participants (Bangkok 165 people, Nakhon Ratchasima 77 people, Ubon Ratchathani 54 people, Khon Kaen 53 people, and Chiang Mai 51 people) as the target sample size. Questionnaires were distributed via a website link and QR code as well as social media, including email, Line, Facebook, and other platforms (e.g., Amazon, computer providers, mobile phone providers, and other e-commerce platforms) relevant to users of PCs and mobile phones.

The questionnaire provided information to participants, including an explanation of the project, project aims, and what participants would be required to do. Before completing the questionnaire, participants provided their consent by ticking a consent box. All information collected was anonymous and treated with the strictest confidence. Once 400 completed questionnaires were received, data collection was stopped (response rate 88.9%).



## Data Analysis

Descriptive statistics, namely, frequency, percentage, mean and standard deviation [SD] were calculated on the study sample. Inferential statistics – a path analysis together with the latent variables – were conducted using structural equation modeling (SEM) to test the four hypotheses (AMOS Version 24).

## Results

### Participant characteristics

A total of 400 participants completed the online questionnaire. The majority of respondents were female (65.25%), and aged 18–32 years (41.75%). With regard to education level, most participants were undergraduates (57.75%). The majority of participants were employees (39%), and were single (57.75%)

### Observed variables' arithmetic mean and standard deviation

Table (Table 1) shows the observed variables. An evaluation of arithmetic mean was defined as an average threshold using a class interval of 0.50 and an interval rating scale ranging from 1 to 5.

**Table 1** Observed variables' arithmetic mean and standard deviation

Latent variables	Observed variables	Mean	Standard deviation (S.D.)
Perception	Perceived product value (Perc1)	3.862	0.990
	Perceived behavior control (Perc2)	3.840	1.091
	Perceived brand or label stereotyping beliefs (Perc3)	3.478	0.987
	Perceived affect towards use (Perc4)	3.622	1.092
Reference	Primary group influence (Ref1)	2.742	1.059
	Aspirational group influence (Ref2)	2.403	1.010
	Membership of traditional social group influence (Ref3)	2.363	0.989
	Membership of modern social group influence (Ref4)	2.800	1.081
Intention	Utilization of electronic products (Int1)	3.890	1.118
	Word-of-mouth (Int2)	3.541	0.968



### **Correlation coefficient among determinants in the model**

The results found that the correlation coefficient values ranged from 0.307–0.733, with all outcomes less than 0.8 ( $p < .05$ ). These findings indicate the existence of multicollinearity deemed to be less presumably to emerge or no multicollinearity (Shrestha, 2020, pp.39-42; Suki & Suki, 2011, pp.1-7; Field, 2013, pp.1-952). Therefore, the 10 observed variables were deemed suitable to be incorporated into the structural equation modelling.

### **Results of latent variable measurement model testing**

The study indicates that the model specification is appropriate by further examining the measurement model of all latent determinants. The study found convergent validity by focusing on an average variance extracted (AVE) technique and factorial validity using the CFA technique in supporting measurement model verification. In addition, discriminant validity was assessed to confirm the distinctiveness of each latent variable.

#### ***Convergent validity***

The construct validity analysis was conducted by focusing on convergent validity using AVE. With respect to the measurement model of perception, the standardized loadings for its indicators (Perc1, Perc2, Perc3, and Perc4) were 0.863, 0.829, 0.821, and 0.776, respectively. For the measurement model of reference, the standardized loadings for Ref1, Ref2, Ref3, and Ref4 were 0.706, 0.865, 0.784, and 0.827, respectively. For the measurement model of intention, the standardized loading for the Int1 and Int2 indicators were 0.833 and 0.865, respectively.

This construct validity analysis indicated AVE values of 0.677 (perception), 0.636 (reference), and 0.721 (intention). As all AVE values were greater than 0.50, all observed variables for each latent variable in the model can be considered to collectively measure these latent variables (Hair et al., 2006, pp.1-899), confirming convergent validity. Therefore, it is reasonable to state that the criteria items for each latent variable demonstrated that they captured the construct and suit for measuring the three latent variables in the model.

#### ***Confirmatory factor analysis: CFA***

With regard to the endorsement of construct validity for the three latent determinants in the model, CFA was also conducted to support testing of the measurement model. The outcomes revealed an overall value of Measure of Sampling Adequacy (MSA) equal to .916. Each observed variable demonstrated its MSA value between .852 and .945 that appeared to be greater than .50. As a result, all the observed variables were deemed appropriate to be used in the CFA (Hair et al., 2019, pp.1-813). Every latent variable passed the test of measurement model inspection based on the following criteria, which are determined relative  $\chi^2$  less than 2, the indices of RMSEA and RMR less than .05, and the indices with regard to GFI, NFI, and TLI greater than .95 (Schumacker & Lomax, 2016, pp.112; Suksawang, 2020, pp.22).



To explain, the findings of the measurement model inspection regarding the perception latent variable revealed the test statistics as  $\chi^2 = 1.968$ ,  $df = 2$ , relative  $\chi^2 = .984$ ,  $p = .374$ ,  $RMSEA = .000$ ,  $RMR = .008$ ,  $GFI = .997$ ,  $AGFI = .987$ ,  $NFI = .998$ ,  $TLI = 1.000$ . Therefore, it is reasonable to believe that the perception latent variable can be measured by the observed variables (Perc1, Perc2, Perc3, and Perc4).

The measurement model with regard to the reference latent variable possessed construct validity. The test statistics of the reference measurement model were identified as  $\chi^2 = 1.899$ ,  $df = 2$ , relative  $\chi^2 = .949$ ,  $p = .387$ ,  $RMSEA = .000$ ,  $RMR = .009$ ,  $GFI = .998$ ,  $AGFI = .988$ ,  $NFI = .998$ . As a result, the reference latent variable can be measured by incorporating the four observed variables: Ref1, Ref2, Ref3, and Ref4.

The test of CFA according to the intention latent variable showed that construct validity was established for intention. The outcomes indicated the following values of test statistics as  $\chi^2 = .000$ ,  $df = 1$ , relative  $\chi^2 = .000$ ,  $p = .996$ ,  $RMSEA = .000$ ,  $RMR = .000$ ,  $GFI = 1.000$ ,  $AGFI = 1.000$ ,  $NFI = 1.000$ . As a consequence, intention can be measured by the two observed variables: Int1 and Int2.

#### ***Discriminant validity***

To establish the discriminant validity, the square root of AVE must be greater than the correlation coefficient between all latent constructs (Hair et al., 2014, pp.603), as shown in Table 2. As a consequence, the differences among each latent variable in this study were confirmed.

**Table 2** Discriminant Validity (D.V.)

Latent Variables	Perception	Reference	Behavioral
Perception	<b>0.823*</b>		
Reference	0.575	<b>0.798*</b>	
Behavioral Intention	0.734	0.679	<b>0.849*</b>

\* Square Root of AVE

Based on the measurement model analysis above, it is reasonable to believe that the criteria items for each latent variable (perception, reference, and behavioral intention) are demonstrated that they captured the construct. There are also differences among the latent variables. Therefore, all the observed variables appear to be appropriate for measuring the three latent variables in the model.



### Relationship model testing between perception, reference, and intention

With respect to the test of the causal relationship model among three latent variables, these findings were used to test the four hypotheses, such as whether the model has good congruence with the empirical data. How perception and reference factors influence consumers' behavioral intention was also clarified (Table 3).

**Table 3** Influence coefficients of causal relationship model

Dependent variables	Reference			Intention		
	TE	DE	IE	TE	DE	IE
Cause variables						
Perception	.60*	.60*	-	.93*	.79*	.14*
Reference	-	-	-	.23*	.23*	-
R-Square	.36			.89		

$$\chi^2 = 23.148, df = 18, \text{relative } \chi^2 = 1.286, p = .185, \text{RMSEA} = .027, \\ \text{RMR} = .025, \text{GFI} = .988, \text{AGFI} = .964, \text{NFI} = .991, \text{TLI} = .995$$

\*  $p < .01$ , TE = Total Effects, DE = Direct Effects, IE = Indirect Effects

The outcomes of the causal relationship model analysis by using AMOS were derived from the conformity index value, as shown in Table 3.

The goodness of fit indices indicated that  $\chi^2 = 23.148, df = 18, \text{relative } \chi^2 = 1.286, p = .185, \text{RMSEA} = .027, \text{RMR} = .025, \text{GFI} = .988, \text{AGFI} = .964, \text{NFI} = .991, \text{TLI} = .995$ . These outcomes are deemed to be compatible with the inspection criteria, which are defined relative  $\chi^2$  less than 2, the indices of RMSEA and RMR less than .05, and the indices with respect to GFI, NFI, and TLI greater than .95 (Schumacker & Lomax, 2016, pp.112; Suksawang, 2020, pp.22).

As a consequence, the development of the causal relationship model in accordance with the influence of perception and the reference group on consumers' behavioral intention indicates congruence with empirical data. The findings appear to support the Hypothesis 1 (H1). The details of analysis are described below:

The perception of electronic products and the electronic waste problem, as well as the reference group, can together explain the variance of consumers' behavioral intention in the aspects of electronic products utilization and word-of-mouth behavior, accounting for 89%.

The perception with respect to e-goods and the e-waste problem as well as the reference group factors, positively influences consumers' behavioral intention in the aspects of electronic products utilization and word-of-mouth behavior at the statistical significance level of .01. These outcomes support Hypothesis 2 (H2) and Hypothesis 3 (H3).

The perception has an indirect effect on consumers' behavioral intention through the reference group and shows the indirect effects value as equaled to .14 at the statistical significance level of .01. The outcome supports Hypothesis 4 (H4).

The most influential determinant affecting consumers' behavioral intention with regard to the aspect of electronic products utilization and the aspect of word-of-mouth behavior is deemed to be perception factor. The minor influence determinant appears to belong to reference group factor. Both determinants had overall effects of .93 and .23 at the statistical significance level of .01, respectively.

To elaborate, the findings of the causal relationship model analysis and model modification are demonstrated in Figure 2.

Figure 2 presents supplementary outcomes with regard to the standardized factor loading of each observed determinant for the three latent variables. The study found that the most important element for perception, reference, and intention factors were Perceived Brand or Label Stereotyping Beliefs (Perc3), Membership of Modern Social Group Influence (Ref4), and Word-of-Mouth (Int2), respectively. These key elements, which related to each latent variable, possessed standardized factor loadings equal to .84, .87, and .88 for Perc3, Ref4, and Int2, respectively.

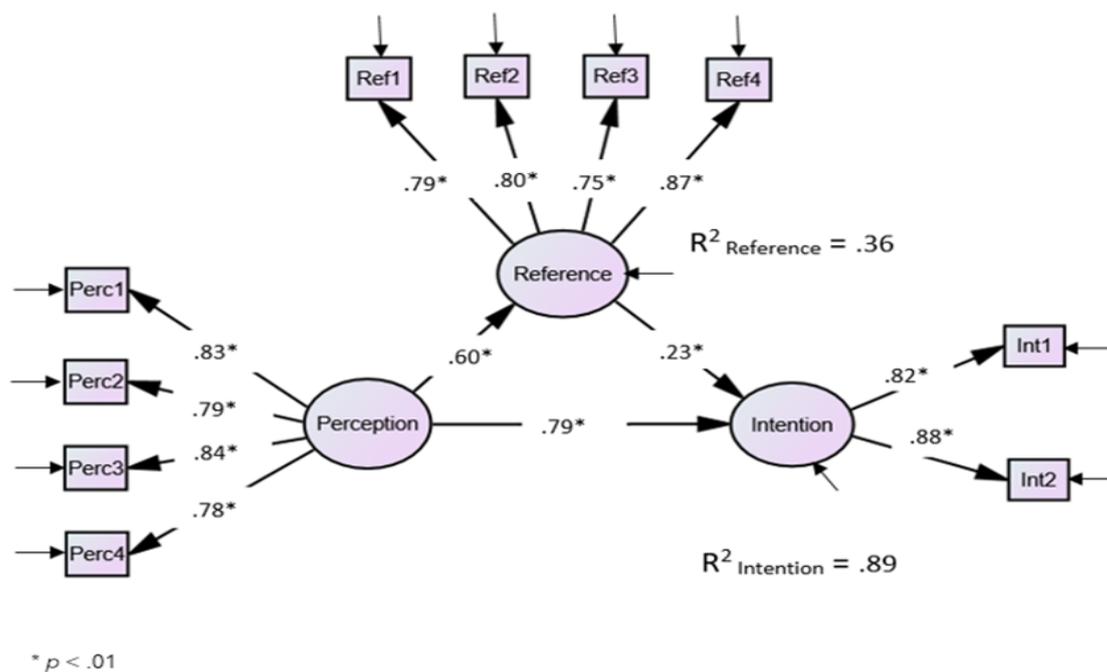


Figure 2 Influence coefficients of causal relationship model



## Conclusion

The development model used in this study is consistent with empirical data. The study data demonstrate that the effects of consumers' perceptions, together with reference group influence, can explain consumers' behavioral intention for product utilization and word-of-mouth. We found that consumers' perceptions of e-products and the e-waste problem, as well as reference group influence, positively affects consumers' behavioral intention. These outcomes are associated consistent with the findings of Chiou (1998, pp.298-308).

Previous studies assert that the reference group directly affects consumers' utilization of PCs (Thompson, Higgins, & Howell, 1991, pp.126). We also found that the reference group influence mediates the influence of consumers' perceptions of e-goods and the e-waste problem on consumers' behavioral intention with respect to electronic product utilization and word-of-mouth behavior. The study indicated that the most important indicator for reference factor could be Membership of Modern Social Group Influence (Ref4). This result appeared to be different from the evidence in the study of Verlegh and Candel (1999, pp.457-464), which identified that the primary group influence demonstrated a superior effect on consumers' behavioral intention than the other groups. This difference is due to the shift of society towards a more digital environment.

Specifically, the determinant perception played a major role in affecting consumers' behavioral intention, with perceived brand, or label stereotyping beliefs (Per3) being the most important indicator. With the transition to a digital world, especially for the younger consumer population, CSR, environmental awareness, and the empowerment of local communities can be a successful brand and business strategy.

## Discussion

The findings of this research identify that the perception determinant together with reference group influence can predict consumers' behavioral intention with a  $R^2$  value of .89 ( $R^2$  intention = .89); therefore, it is plausible that the outcomes of this study are reliable, generalizable, and helpful for practical implications.

### Practical Implications

The latent variable perception positively influences consumers' behavioral intention ( $p < .01$ ). These findings are comparable to a study by Chiou (1998, pp.298-308) which showed that perception factor had a positive relationship with consumers' behavioral intention in purchasing or using a specific product. These data also identify that the effect of perception



(latent determinant) appears to be the most influencing consumers' behavioral intention, with both a direct effect and indirect effect (with the reference variable acting as a mediator).

Individual humans' perception influence towards a particular substance or matter information (e.g., brand, eco label, or environmental seal reliable) are likely to be evaluated their senses in a positive way and consecutively turned into possessing their good belief on consumers' behavioral intention (Chaweasuk & Wongjaturapatra, 2012, pp.2). These could be the reasons behind the study's outcomes.

With perception having a major role in consumers' behavioral intention, perceived brand belief is an important marketing tool. A cognitive process associated with consumer behavior theory – the halo model – suggests its potential role in shaping consumer beliefs (Ahmed et al., 2004, pp.102-20), about a particular brand or label. These beliefs can affect Thai consumers' behavioral intention and actions. Marketers and managers can, therefore, increase brand credence through brand image and employ marketing activities to build brand association and engagement with their target market, such as through CSR, creating shared value (CSV), social innovation, and/or business ecosystem projects. These initiatives have the potential to elevate brand image and corporate credibility in consumers' minds, including perceptions and beliefs towards a specific brand. As those images with respect to product/service, brand, and institution can play the roles in shaping consumers' attitudes/beliefs and behaviors to do something (Kotler, 2000, pp.174). Firms can also develop packaging and labeling to identify their electronic products as environmentally-friendly. Environmentally reliable branding includes: ENERGY STAR, EPEAT, Eco Highlights, award-winning green products (e.g., IDEA award for excellent design). Symbols can also be used to emphasize the circular economy (circular business model)/green economy for the promotion of electronic goods helping to inspire consumer brand beliefs. Building a positive belief towards a brand can help to influence consumers' perceptions and ultimately purchasing or usage behavior (Sareerat et al., 2000, pp.78).

Perception also indirectly affects consumers' behavioral intention through the reference group. If the reference group has a greater perception of e-goods and the e-waste problem, they increasingly play role as influencers by providing recommendations and credibility to consumers with respect to behavioral intention. This finding is confirmed by Samitthikrai (2011, pp.321), who stated that consumers who lack sufficient knowledge or information about a specific product usually have less confidence in their intended behavior when purchasing or using a particular product. Therefore, consumers appear to rely on reference group influence, which has a role in affecting their intended behavior. As a result, marketers, managers, and government sector should raise awareness and provide education



to consumers about e-goods and the e-waste problem. In addition, influencers should also be educated. This tactic would help the influencers or reference groups to have more understanding and gain their knowledge through their perceptions towards e-goods and the e-waste problem. Eventually, a reference group would play a potential mediating role as a halo effect to influence consumers to believe or conformably do something without difficulty (Hui & Zhou, 2003, pp.133-153) thus increasing Thai consumers' behavioral intention to maximize utility of the electronic products as well as their intention to promptly spread word-of-mouth.

These outcomes show that the reference group can positively influence consumers' behavioral intention. This evidence is compatible with a previous study that found a social factor, such as the reference group, influenced the utilization of PCs (Thompson, Higgins, & Howell, 1991, pp.126). Ajzen (2002, pp.665-683) asserted that the reference group appeared to be a potential factor leading individuals to follow the behavior of the reference group. Further studies have also shown that the reference group has a positive relationship and influences consumers' purchases, or behavioral intention to use a particular product (Chiou, 1998, pp.298-308; Verlegh & Candel, 1999, pp.457-464). Chiou (1998, pp.298-308) stated that this occurred with both consumers who possessed little knowledge and those who had a greater knowledge of a specific product. Therefore, based on findings from this study, if there is more conformity with the reference group, consumers tend to increasingly shape their behavioral intention in the same way as the reference group. We also found that there was a salient key element for the reference latent factor, which was membership of modern social group influence, implying that online social network groups such as Facebook, Line, Instagram, Twitter, and WeChat, have a greater influence on consumers' behavioral intention in e-good usage than other indicators of the reference factor. The majority of respondents in this research were aged between 18–32 years, e.g., Generation Z and Millennials (Beresford Research, 2022); this generation of consumers have the most exposure to, and use of the internet and online media (Bangkokbiznews, 2021). With economic and social culture shifting towards digital transformation driving consumers' behavioral change, firms need to coordinate their offline and online marketing to communicate effectively with consumers in the marketplace through various reference groups, especially modern social groups. A way to do this could be to use influencer marketing for example, by conducting micro-influencer marketing for modern social groups and creative campaigns, rather than a large campaign to engage with the whole consumer base. Content marketing could also be used within modern social groups to promote eco-friendly e-product use.



With regard to intention factor, these findings indicate that word-of-mouth is an important indicator for consumers' behavioral intention and has a greater standardized factor loading value than the product utilization indicator. It could be that using word-of-mouth allows easy communication between individuals to quickly spread news or information (Confente, 2015, pp.613-624), such as brand information. As a consequence, Thai consumers' expression of their behavioral intention through word-of-mouth is easier and faster than product utilization. Therefore, branding and creating positive attitude towards eco-friendly labelling by building on a word-of-mouth and electronic word-of-mouth marketing strategy, as well as affiliate (or referral) marketing strategy, would be simple ways of increasing sales. Word-of-mouth behavior plays a role in rapidly helping firms market their products and influence consumers behavior (Palachai, 2015, pp.1-93), such as brand loyalty, purchase retention, reuse, product utilization, maintain existing customer base, and expanding new business prospects.

## Recommendations

### Limitations and Future Research

Limitations included data collection through an online survey, rather than a field investigation; this was due to the COVID-19 pandemic restrictions. Financial and time constraints meant that only five provinces were sampled; however, these provinces were the largest producers of e-waste per year in Thailand at the time of data collection. Broadening the boundary survey areas within Thailand as well as enlarging the sample size for future research would be beneficial to provide further insights. Additionally, a longitudinal study at regular time points could provide an ongoing understanding of consumer behavioral change. Further research could also be conducted on other factors, other e-good products, as well as differentiating among consumer types and word-of-mouth or e-word-of-mouth implications.

## References

- Ahmed, Z. U., Johnson, J. P., Yang, X., Fatt, C. K., Teng, H. S., & Boon, L. C. (2004). Does country of origin matter for low-involvement products? *International Marketing Review*, 21(1), 102-120. <https://doi.org/10.1108/02651330410522925>.
- Ajzen, I. (1985). *From intentions to actions: a theory of planned behavior. in action control, from cognition to behavior: chap. 2* (pp.11-39). Berlin, Springer-Verlag. [https://doi.org/10.1007/978-3-642-69746-3\\_2](https://doi.org/10.1007/978-3-642-69746-3_2).



- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32(4), 665-683. <https://doi.org/10.1111/j.1559-1816.2002.tb00236.x>.
- Bangkokbiznews. (2021). *Thailand internet user behavior 2021*. Retrieved December 18, 2021, from <https://www.bangkokbiznews.com/tech/978041>.
- Beresford Research. (2022). *Age ranges by generation*. Retrieved October 11, 2022, from <https://www.beresfordresearch.com/age-range-by-generation>.
- Bryman, A., & Bell, E. (2015). *Business research methods* (4<sup>th</sup> ed.). Oxford University Press.
- Chaweasuk, S., & Wongjaturapatra, S. (2012). Theories of information technology use acceptance. *KMITL Information Technology Journal*, 1(1), 1-21.
- Chen, C., & Chen, F. (2010). Experience quality, perceived value, satisfaction and behavioral intentions for heritage tourists. *Tourism Management*, 31, 29-35. <https://doi.org/10.1016/j.tourman.2009.02.008>.
- Chiou, J. (1998). *The effects of attitude, subjective norms, and perceived behavioral control on consumers' purchase intentions: the moderating effects of product knowledge and attention to social comparison information*. Retrieved March 9, 2025, from <https://scispace.com/pdf/the-effects-of-attitude-subjective-norm-and-perceived45je-hjyjad.pdf>.
- Chokenukul, P., Sukhabot, S., & Rinthaisong, I. (2019). A causal relationship model of purchasing behavior of consumers in Thailand regarding processed fish products. *Kasetsart Journal of Social Sciences*, 40(2), 366-372. <https://doi.org/10.1016/j.kjss.2017.10.006>.
- Confente, I. (2015). twenty-five years of word-of-mouth studies: a critical review of tourism research. *The International Journal of Tourism Research*, 17(6), 613-624. <https://doi.org/10.1002/jtr.2029>.
- Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, 28(3), 307-319. <https://doi.org/10.2307/3172866>.



- Eco-Business. (2025). *Fuji Xerox launches eco campaign*. Retrieved January 29, 2025, from <https://www.eco-business.com/press-releases/fuji-xerox-launches-eco-campaign>.
- Environmental and Pollution Control Office 13. (2018). *Electronic trash in Thailand*. Retrieved July 24, 2018, from <https://epo13.pcd.go.th/th/news/detail/20817>.
- Field, A. (2013). *Discovering statistics using IBM SPSS Statistics* (4<sup>th</sup> ed.). SAGE Publications.
- Future-Fit Business. (2025). *The body shop's bio-bridges mission*. Retrieved January 10, 2025, from <https://futurefitbusiness.org/case-studies/the-body-shops-bio-bridges-mission>.
- George, D., & Mallery, P. (2003). *SPSS for windows step by step: a simple guide and reference, 11.0 update* (4<sup>th</sup> ed.). Allyn and Bacon.
- Green News. (2018). *Thailand: city of global bin*. Retrieved July 18, 2018, from <https://greennews.agency/?p=17662>.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. (2014). *Multivariate data analysis* (7<sup>th</sup> ed.). Pearson.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. (2010). *Multivariate data analysis: a global perspective* (7<sup>th</sup> ed.). Pearson.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., Tatham, R. L. (2006). *Multivariate data analysis* (6<sup>th</sup> ed.). Pearson.
- Hair J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8<sup>th</sup> ed.). Cengage.
- Hui, M. K., & Zhou, L. (2003). Country-of-manufacture effects for known brands. *European Journal of Marketing*, 37(1/2), 133-153. <https://doi.org/10.1108/03090560310458664>.
- Kotler, P. (2000). *Marketing management* (The Millennium ed.). Prentice Hall.
- Kotler, P., & Lee, N. R. (2005). *Corporate social responsibility: doing the most good for your company and your cause*. John Wiley and Son, Inc.
- National Statistical Office Thailand. (2019). *Important statistics and indicators*. Retrieved August 1, 2025, from [https://www.nso.go.th/nsoweb/nso/statistics\\_and\\_indicators?impt\\_branch=300](https://www.nso.go.th/nsoweb/nso/statistics_and_indicators?impt_branch=300).



- Palachai, N. (2015). *The influence of electronic word-of-mouth marketing (ewom) and 3i model of brand development on the decision to buy motorcycles of people in Bangkok*. Independent Study, Master of Business Administration Program, Graduate School, Bangkok University.
- Petrick, J. F., & Backman, S. J. (2002). An examination of the construct of perceived value for the prediction of golf travelers' intentions to revisit. *Journal of Travel Research*, 41(1), 38-45. <https://doi.org/10.1177/004728750204100106>
- Samitthikraj, C. (2011). *Consumer behavior*. Chulalongkorn University Press.
- Sareerat, S., Sirikutta, S., Attirawong, W., Sanchanon, P., & Hirankitti, P. (2006). *Marketing research*. Dhammasan Co., Ltd.
- Sareerat, S., Sereerat. S., Patavanich, O., Laksitanon, P., & Limthai, S. (2000). *Principles of marketing*. Thirafilm and Sightex Co., Ltd.
- Schumacker, R. E., & Lomax, R. E. (2016). *A Beginner's guide to structural equation modeling* (4<sup>th</sup> ed.). Routledge.
- Shil, P. (2012). Evolution and future of environmental marketing. *Asia Pacific Journal of Marketing & Management Review*, 1(3), 74-81.
- Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of Applied Mathematics and Statistics*, 8(2), 39-42. <https://doi.org/10.12691/AJAMS-8-2-1>
- Statista Research Department. (2025). *Consumer electronics industry in Thailand-statistics and facts*. Retrieved August 8, 2025, from <https://www.statista.com/topics/8457/consumer-electronics-industry-in-thailand/#topicOverview>.
- Step-initiative. (2025). *List of StEP members*. Retrieved June 17, 2025, from <https://www.step-initiative.org/list-of-step-members.html>.
- Suki, N. M., & Suki, N. M. (2011). Exploring the relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3g mobile services. *Journal of Information Technology Management*, 22(1), 1-7.
- Suksawang, P. (2020). *Structural equation modeling* (3<sup>th</sup> ed.). A.P. Blue Print.



- Tarn, J. L. (2008). The effects of service quality, perceived value and customer satisfaction on behavioral intentions. *Journal of Hospitality and Leisure Marketing*, 6(4), 31-43.  
[https://doi.org/10.1300/J150v06n04\\_04](https://doi.org/10.1300/J150v06n04_04).
- Tapsai, C. (2015). The online test bank management system in integration model. *Procedia-Social and Behavioral Science*, 197, 2544-2547. <https://doi.org/10.1016/j.sbspro.2015.07.619>.
- TDRI. (2016). *Big 5 national environment problems challenge development*. Retrieved August 15, 2016, from <https://tdri.or.th/2016/08/2016-08-14>.
- The Standard. (2018). *Thailand becoming global electronic waste dumping*. Retrieved June 6, 2018, from <https://thestandard.co/thailand-becoming-global-electronic-waste-dumping>.
- Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: toward a conceptual model of utilization. *MIS Quarterly*, 15(1), 125-143.
- Verlegh, P. W., & Candel, M. J. (1999). The consumption of convenience foods: reference groups and eating situations. *Food Quality and Preference*, 10(6), 457-464.  
[https://doi.org/10.1016/S0950-3293\(99\)00042-7](https://doi.org/10.1016/S0950-3293(99)00042-7).
- Vlachos, P. A., Tsamakos, A., Vrechopoulos, A. P., & Avramidis, P. K. (2009). Corporate social responsibility: attributions, loyalty, and the mediating role of trust. *Journal of The Academy of Marketing Science*, 37(2), 170-180. <https://doi.org/10.1007/s11747-008-0117-x>.
- Vongmahasetha, T. (2016). Corporate social responsibility (csr) and trust influencing consumer's loyalty for products in energy industry. *Research and Development Journal Suan Sunandha Rajabhat University*, 8(1), 137-147.
- Warotwattananont, P. (2015). The determinant that influence to word of mouth in the digital age. *Journal of Communication and Management NIDA*, 1(1), 86-100.
- Zikmund, W. G., & Babin, B. J. (2015). *Essential of marketing research* (6<sup>th</sup> ed.). Cengage.
- Zimbardo, P. G., Ebbesen, E. B., & Maslach, C. (1977). *Influencing attitudes and changing behavior: an introduction to method, theory, and applications of social control and personal power* (2<sup>nd</sup> ed.). Random House.