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THE DEVELOPMENT OF THEORETICAL FRAMEWORK FOR THE BEHAVIORAL MANAGEMENT OF USED DRY BATTERIES IN A HOUSEHOLD

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Abstract

Nowadays, most households use dry batteries even though they are hazardous waste at the end of the lifetime. Actually, the waste must be separated, collected and disposed. However, this basic household hazardous waste management has not been successfully managed in Thai households. So the objective of this research was to develop the household behavior in using dry batteries

prediction model. The methodology was divided into 3 steps. The first step is to define the concept and the operational definition of variables. The second step including the preliminary steps shows the questionnaire content. The third step is the score indicators in questionnaire. This research results are; 1) content validity test 2) reliability test and 3) the prediction model. It can be indicated into 3 major components. The first component consists of household factors, which are perception, social influence, optional vision, and knowledge. The second component relates to environmental factors, which are receiving information, experience, and reinforcement. The third component is intention. This modeling will be formed into structural equation model including interpret for the policy maker and planner. It will be able to manage the used batteries from household in accordance with the conditions of each local municipality more effectively.

Keywords

Theoretical Framework, Behavioral Management, Used Dry Batteries, Household

1. Introduction

In 2013, it was found out that the amount of hazardous waste in Thailand was about 0.56 million tons. According to the research, those number came from electronic appliances from local community. From that number, 65 percent of them came from carcasses, appliances and electronics, and 35 percent came from small electronic waste, namely dry battery, light bulb and chemical container. The hazardous waste from electronic devices increased about 10 percent per year. Although electronic waste shared small quantity in the total disposed waste. Somehow, it must be disposed by the hazardous waste treatment processes (Kiddee, Naidu &Wong, 2013).

Most of Household Hazardous Waste (HHW) from electronic devices are bulky such as television, air-conditioner, mobile battery etc. However, they still have economic value. This kind of waste should have clear disposal guideline. (Tchobanoglous & Kreith, 2002 and Vesilind, Worrell & Reinhart, 2002) Another group of HHW is small electronic devices such as fluorescent, syringe, spray can, dry battery etc. This group of waste does not have benefit or economic value so that they will not be sorted out or disposed by HHW disposal guideline. It can be left with solid waste (Asari & Sakai, 2013).

The disposal of small electronic devices together with solid waste also cause leakage. Moreover, the leakage leads to the contamination of heavy metals, toxic metals and chemicals

from the product contaminating to the environment, ecosystems, food chain and human (Susana, Delgado, Almeida & Costa, 2009; Kiddee, Naidu & Wong, 2013; Agency for Toxic Substances and Disease Registry, 2014 and Chen & et al., 2015).

According to the consideration of HHW from physical area, it was found out that local municipality generates HHW more than other areas because the municipality is the area with high social capital. It is the main activity and environmental problems, which caused by human action. Normally, HHW came from appliances and electronic devices consuming among household in one municipality. The problem of waste and hazardous substances result from households manage HHW wrong. (George, Hilary & Samuel, 1993)

The theoretically waste management has been recognized as the best solution to reduce at source. The management related to household behavior to make cognition willingness and action to reduce, eliminate or damage are the desirable environment. (George, Hilary & Samuel, 1993) This approach aims at reducing environmental damage as much as possible. The environmental behavior is intent behavior that depends on the awareness and cooperation from each household. Factors related to human disposing used batteries in household level behavior can develop from theories about the general behavior, model of the pro – Environmental behavior and other correlation researches of the environmental behaviors

This paper will access human behavior in managing the use of dry batteries in household level. At present, Thailand has no laws or regulations enforcing household to separate used batteries out of other solid waste. With that reason, used dry batteries are discarded and disposed with solid waste. The main research question of this study is which factors have impact on human behavior in managing the used dry batteries in household level? So the objective of this research was to develop the household behavior in using dry batteries prediction model.

2. Literature Review

2.1 The General Behavior Theories

Various factors have been brought up from 4 main concepts in chronological order as follows; Basic Behavior Model, Theory of Reasoned Action, Theory of Planned Behavior, and Interactionism Model.

The first theory is basic behavior model. The theory will explains about environment knowledge leading to environmental attitude factors. Those factors consist of environmental awareness and environmental concern. (Burgess et al., 1998 and Kollmuss & Agyeman, 2002)

The second theory is the theory of reasoned action 'TRA'. The special factor of the TRA is 'Intention factor'. This factor proximally causes behavior. In environment behavior term, this theory shows that the perceived education about environmental issue leads to an action, which is called automatic environmental behaviors. (Kollmuss & Agyeman, 2002)

The third theory is the theory of planned behavior or TPB. The theory develops from TRA (Ajzen & Fishbein, 1980), and focuses on the importance of intention in performing particular behavior. This theory assumes that people have rational basis for their behavior, in which the perceived behavioral control (PBC) is added as new factor in the original of the TRA. The PBC reflects 2 sub factors; the effects of external conditions on and the individual's perceived ability to adopt a particular behavior. (Ajzen, 1988, 1991, 2002 and Ajzen & Madden, 1986)

The final theory is interactionism model. The main issue of this theory consists of 2 main influences to the environmental behavior: 1) trait model and 2) situationism model (Magnusson & Endler, 1977; Tett & Burnett, 2003 and Walsh, Craik, & Price, 2000)

All of four main behavior theories, we can divide basic factors, which influence to environmental behavior into two groups; 1) the internal factors such as knowledge, attitude, perception etc. This factor means physical and mental aspects of an individual. It is personality factors, which influence person's behavior to environment. 2) the external factors such as situation, policy, supporting etc. This factor means environment of an individual. The interaction of supporting factors are not only within themselves, but they also influence social, environmental or cultural environment. (Krajhanzl, 2010)

2.2 Pro – Environmental Behavior Model

Pro – environmental behavior means a protective way of environmental behavior or a tribute to healthy environment of human behavior. And from the general behavior theories to the pro – environmental behavior model in various researches, they also relate to a number of factors. Some factor was charged in term of name, and was added with new factor in the behavior model of research. In this paper, it presents 6 pro – environmental behavior models, because it relates to the behavior in managing the used dry batteries.

The first model is ecological behavior model. The ecological behavior of the model contained 4 direct factors; environmental attitude and values factor, possibilities to act ecologically factor, behavioral incentives factor and perceived feedback about ecological behavior factor. These factors also includes one indirect factor. It is the environmental knowledge factor. (Fietikau & Kessel, 1981; Kollmuss & Agyeman, 2002 and Latif, Omar, Bidin & Awang 2013)

The second model is Responsible environmental behavior model. The methodology is the Meta – analysis. It was found out that the following factors associated with responsible pro – environmental behavior; 1) knowledge of issues 2) knowledge of action strategies 3) locus of control 4) attitudes 5) verbal commitment and 6) an individual's sense of responsibility. (Hines, Hungerford & Tomera, 1987; Kollmuss & Agyeman, 2002 and Latif, Omar, Bidin & Awang, 2013)

The third model is the pro – environmental behavior of Kollmuss and Agyeman. This model was found that the two narrower arrows from internal and external factors direct to pro – environmental behavior, which indicate environmental actions. The internal factors consist of personality traits, value system, knowledge, feelings, fear, and emotional involvement. The external factors consist of infrastructure, political, social and cultural factors economic situation etc. Both internal and external factors have the direct and indirect effect to the model. For indirect influences, it transmitted through the old behavior patterns. (Hines, Hungerford & Tomera, 1987; Kollmuss & Agyeman, 2002 and Latif, Omar, Bidin & Awang, 2013)

The fourth model is the pro – environmental behavior. It is explained that the influence of pro – environmental behavior consists of the 3 main factors; environmental values factor, situation factor, and psychology factor. The main objective of this model focuses on the cultural context. The difference cultural context had brought the pro – environmental behavior with the same factors. (Price & Pitt, 2011 and Latif, Omar, Bidin & Awang, 2013)

The fifth model is the contextual psychological model of recycling behavior, which also includes the used batteries of Hansmann, Bernasconi, Smieszek, Loukopoulos and Scholz (2006). It was found out that the 6 factors, which are recycling knowledge, self-organization of recycling, disagreement with justifications for non-recycling, attitudes towards ecological waste disposal, trust in waste disposal authorities and population were positively related to recycling behavior. At the same time, attitudes towards ecological waste disposal and trust in waste

disposal authorities were not directly related to respondents' self-reported battery recycling behavior. It is also noted that communication is an essential element for accessing personal information.

The last model is the recycling behaviour of Latif, Omar, Bidin and Awang that directly related to the environmental values, exerts a direct and indirect influence to both pro – environmental behavior and recycling behavior. The indirect way had an influence to the intention factor. In addition, the model also pointed out that if different cultures applies different factors, it will bring different behaviors to the community. (Latif, Omar, Bidin & Awang, 2012, 2013)

All factors of the model in this paper were found that each model has the same co – main factors. Likes the general behavior theories conclusion, pro – environmental is influenced by internal factors, which are physical and mental aspects of an individual or psychology aspect, and external factor, which are environment of an individual of social aspect.

Moreover, we also found out that special factor, which is spited from the internal and external factor, will lead to the six pro environmental behaviors as well. It is 'an intention factor'. It can be both the cause and / or the effect of environmental behaviors model. At the last point, this paper found direct and indirect relationship of each pro - environmental behavior factor. We also add the intention factor into the pro – environmental behavior model in this paper.

As a result, both general behavior theories and pro – environmental behavior models can be concluded as 3 main factors of the behavior in management of the used dry batteries; 1) Internal factor, 2) External factor, and 3) intention to act factor. The next section, we will investigate the process of development of sub – factor related to pro - environmental behavior.

2.3 Development of Factors that Influence Pro - Environmental Behavior

There are 2 goals in this study. The first one is to select and identify factors from the theories and the validity associated with pro - environmental behavior, which related to the behavior in management of the used dry batteries. The second one is to determine quantitative strengths of these relationships. These factors should be able to lessen any threat to environment.

In this section, the sub – factor that influence human behavior will be demonstrated. For sub – factors are synthesized from the pro – environmental research, we will study about the relationship between the pro – environmental behavior and its factors. The selection criteria are

determined by 1) the significance level (0.00, 0.01 and 0.05) and 2) the size relationship of the correlation statistics (r = over 0.29) (Cohen, 1988). The sub - factor developing is split into 3 parts, which are internal factor, external factor, and intention to act factor.

The first part shows the relationship between internal factors and pro - environmental behaviors. Several internal factors of pro – environmental behaviors will be changed from 'Internal factors' to 'household factors', and categorize from 'several factors' to '4 factors' in table 1. This second group of the external factors of pro – environmental behaviors will be changed from 'External factors' to 'Environmental factors', and categorize from 'several factors' to '3 factors' in table 2, and the last part of this paper remains this factor namely 'intention to act factor' in table 3.

Table 1: *The list of the correlation statistics and the significance level of internal factors with the pro - environmental behaviors*

Internal factors (A)	**Pro - environmental behaviors (B)**	**Correlation and significance level**	**Reference**
Social influence	Environmental behavior	r = 0.33*	Stets & Biga, 2003
Subjective Norm	3R behavior	r = 0.32**	Biswas, Licata, McKee, Pullig & Daughtridge, 2000
Subjective Norm	3R behavior	r = 0.30**	
Emotion	Environmental behavior	r = 0.707*	Hines, Hungerford & Tomera, 1987
Emotion	3R behavior	r = 0.71**	Biswas, Licata, McKee, Pullig & Daughtridge, 2000
Emotion	3R behavior	r = 0.61**	
Attitude	Environmental behavior	r = 0.43	Hines, Hungerford & Tomera, 1987
Attitude	3R behavior	r = 0.48**	Biswas, Licata, McKee, Pullig & Daughtridge, 2000
Attitude	3R behavior	r = 0.31**	
Attitude	Environmental behavior	r = 0.40*	Stets & Biga, 2003
Awareness	Environmental behavior	r = 0.43*	
Awareness	Hazardous waste management behavior	r = - 0.39**	Promsiri, 2001
Locus of control	3R behavior	r = 0.76*	Bortoleto, Kurisu & Hanaki, 2012
Locus of control	Environmental behavior	r = 0.365	Hines, Hungerford & Tomera, 1987
Perception	3R behavior	r = 0.466*	Bortoleto, Kurisu & Hanaki, 2012
Perception	Environmental	r = 0.50*	Stets & Biga, 2003

Internal factors (A)	Pro - environmental behaviors (B)	Correlation and significance level	Reference
	behavior		
Perception	3R behavior	r = 0.70**	Latif, Omar, Bidin & Awang, 2012
Perception	Environmental conservation behavior	(r = 0.41, P = 0.001)	Latif, Omar, Bidin & Awang, 2012
Perception	Environmental behavior	(r = 0.59, P < 0.05)	Stets & Biga, 2003
Perception	Environmental behavior	r = 0.52*	
Knowledge	Environmental behavior	r = 0.38	Hines, Hungerford & Tomera, 1987
Knowledge	Environmental behavior	r = 0.35	
Knowledge	Environmental behavior	r = 0.34	
Knowledge	Environmental behavior	r = 0.33	
Knowledge	Environmental conservation behavior	r = 0.32	Latif, Omar, Bidin & Awang, 2013
Knowledge	Hazardous waste management behavior	r = - 0.32**	Promsiri, 2001

Table 2: *The list of the correlation statistics and the significance level of external factors with the pro - environmental behaviors*

External factors (A)	Pro - environmental behaviors (B)	Correlation and significance level	Reference
Reinforcement	Environmental behavior	r = 0.69*	Hines, Hungerford & Tomera , 1987
Reinforcement	Sustainability behavior	r = 0.6**	Hou, Al-Tabbaa, Chen & Mamic, 2014
Reinforcement	Sustainability behavior	r = - 0.39**	Hou, Al-Tabbaa, Chen & Mamic, 2014
Experience	3R behavior	r = 0.78**	Biswas, Licata, McKee, Pullig & Daughtridge, 2000
Reinforcement	3R behavior	r = 0.42**	Biswas, Licata, McKee, Pullig & Daughtridge, 2000

Table 3: *The list of the correlation statistics and the significance level of intention to act with the pro - environmental behaviors*

Intention to act (A)	Pro - environmental behaviors (B)	Correlation and significance level	Reference
Intention to act	Environmental conservation behavior	r = 0.52	Bamberg & Moser, 2007
Intention to act	Environmental behavior	r = 0.49	Hines, Hungerford & Tomera, 1987
Intention to act	3R behavior	r =0.39*	Ohtomo, Hirose, 2007
Intention to act	3R behavior	r = 0.38**	Chan, 1998
Intention to act	3R behavior	r = 0.33*	Barr, 2007

The model was adopted for our research on pro – environmental behaviors. It is mainly based on the theoretical framework in this paper. Thus, this model should be predicted the behavior in management of the used dry batteries in household level. Moreover, there are many factors that need to be considered.

The first one is household factors, which consist of perception (Hines, Hungerford & Tomera, 1987; Biswas, Licata, McKee, Pullig & Daughtridge, 2000; Promsiri, 2001; Stets & Biga, 2003 and Bortoleto, Kurisu & Hanaki, 2012), social influence (Biswas, Licata, McKee, Pullig & Daughtridge, 2000 and Stets & Big,2003), optional vision (Hines, Hungerford & Tomera, 1987; Grob, 1995; Stets & Biga, 2003; Bortoleto, Kurisu & Hanaki, 2012 and Latif, Omar, Bidin & Awang, 2012, 2013), and knowledge (Hines, Hungerford & Tomera, 1987; Promsiri, 2001 and Latif, Omar, Bidin & Awang, 2013).

The second one is external factor, which are receiving the information factor (Chaipaitoon, 2005); category of information (Chaipaitoon, 2005) and sources of information (Barr, 2007), experience (Biswas, Licata, McKee, Pullig & Daughtridge, 2000; Tonglet, Phillips & Bates, 2004 and Barr, 2007) and reinforcement (Hines, Hungerford & Tomera, 1987; Biswas, Licata, McKee, Pullig & Daughtridge, 2000; Barr, 2007; Hou, Al-Tabbaa, Chen & Mamic, 2014 and D'Amato, Mancinelli & Zoli, 2016).

And the last factor is intention to act factor (Hines, Hungerford & Tomera, 1987; Chan, 1998; Barr, 2007 and Ohtomo & Hirose, 2007). Both direct and indirect relationship leads to the behavior in managing the used dry batteries in household level.

3. Methodology

The measurement about human behavior in managing the used dry batteries factors, household factors, and environmental factors uses questionnaires as the research tools. This paper analyzes only the measurement model, which is one of the processes and the first step in structural equation modeling (SEM). In the previous section, we construct the behavior model in managing the use of dry batteries from the literature review. In this section, we show how to construct the factor indicators in 3 parts: source of indicator, operational definition and the score of indicators.

3.1 Source of Indicator

The indicator of the behavior in managing the used dry batteries based on several pro – environmental behaviors literature such as recycling shopping behaviors, waste prevention behavior household hazardous waste separation and behavior of electronics waste management and information obtained from the elicitation interviews. The selection criteria of indicator was set in each factor, which followed table 2.3 is the reliability statistics over 0.67 (Cohen, 1988). If any indicators has low reliability but it matches this context, it will be kept for the study.

The household factors: The indicator of perception factor was developed from Biswas, Licata, McKee, Pullig & Daughtridge (2000) ($\alpha = 0.83$) and Vincent, Renate, Oldrich & Ron (2015) ($\alpha = 0.85$), Social influence factor developed from Stets and Biga (2003) (the omega reliability = 0.77) and Tonglet, Phillips and Bates (2004) ($\alpha = 0.74$), Optional vision factor was developed from Stets and Biga (2003) (the omega reliability = 0.77) and Bortoleto, Kurisu and Hanaki (2012) ($\alpha = 0.70$), and Knowledge factor was developed from Promsiri (2001) ($\alpha = 0.70$) Amornakarawat (2004) (spearman brown's correction = 0.84) Chaipaitoon (2005) ($\alpha = 0.71$) and Sornsil (2006) (K.R.20 = 0.80).

The environmental factor: The indicator of Received knowledge factor (Type of knowledge factor) developed from Promsiri (2001) Amornakarawat (2004) Chaipaitoon (2005) Sornsil (2006), Received knowledge factor (Sources of knowledge factor) developed from Promsiri (2001) Amornakarawat (2004) Chaipaitoon (2005) Sornsil (2006) , Experience factor developed from Chaipaitoon (2005) ($\alpha = 0.86, 0.84, 0.84, 0.85, 0.84$) and Reinforcement factor developed from Hines, Hungerford and Tomera (1987) Hou, Al-Tabbaa, Chen and Mamic (2014) and D'Amato, Mancinelli and Zoli (2016).

The indicator of intention to act factor was developed from Oreg and Katz-Gerro (2006) ($\alpha = 0.82$), and the last factor, the indicator of the behavior factor was developed from In-Ood (2005) (Discrimination = .076, 0.74, 0.69), and Sornsil (2006) ($\alpha = 0.77$).

The indicator aimed at capturing the actual behavior that can be performed by the respondents in the household and in relation to their municipality. Therefore, the question, which used to measure how often they manage certain activities relating to buying, separation and collection, and disposition of dry batteries, should be informed.

3.2 Operational Definition

The structured questionnaire was designed to measure all constructs that involved in the study. According to the questionnaire, human behavior in managing the used dry batteries and household and environmental factors were operationalized:

- Household behavior in managing used dry batteries – the level of buying, separating and collecting, and disposing behavior about the used dry batteries (35 indicators)
- Intention for future act, in another word household behavior in managing the used dry batteries intentions. (13 indicators)
- Household factors include;
    (1). Perception factor - the household's perception for problems and management of hazardous wastes (separated, collected and disposed) (23 indicators)
    (2). Social influence factor - the household's perception from social pressure to perform or not to perform or manage household hazardous waste and used dry batteries (separated, collected and disposed) (14 indicators)
    (3). Optional vision factor – the household's perception and concern to undesired behavior about the problems and management of hazardous wastes (separated, collected and disposed) (13 indicators)
    (4). Knowledge factor - the household's academic knowledge about impact to environmental problem issue, and management of hazardous wastes and used dry batteries (separated, collected and disposed). (11 indicators)
- Environmental factors include;
    (1). Receiving the information factor - Ability of household to access the detail about problems and management pattern of hazardous wastes and used dry batteries

(separated, collected and disposed). There are 2 types of information, which are information category and information source. (27 indicators)

(2). Experience factor – Participation in activity or project about household hazardous waste management (separated, collected and disposed) of household (25 indicators)

(3). Reinforcement factor – physical factors may facilitate the inhibit management of household hazardous waste and used dry batteries (separated, collected and disposed) (18 indicators)

3.3 Score of Indicators

The answer of the behavior in managing the used dry batteries was captured on a 5 – point Likert scales from '0 = never' up to '4 = always'. The answer of Intention to act were measured on a 5 – point Likert scales from '0 = not agree' up to '4 = strongly agree'. Household factors include perception factor, social influence factor, and optional vision factor. Environmental factors can be concluded from experience factor, and reinforcement factor. Both of the main factors are expected to have direct or indirect influence on the behavior in managing the used dry batteries in household. The scale measured the true action or agreement on a 5 – point Likert scales from '0 = absolutely not' up to '4 = absolutely'. The environmental knowledge factor in household factor ask respondent to answer '0 = false' or '1 = true'. Negative indicators were scored in reverse. The received environmental knowledge factor in environmental factor was captured on a 5 – point Likert scales ranging from '0 = not at all' to '4 = very much'.

3.4 The Source of Data Collection

The target population for this research defined to include the 7 academic expertise in behavior, environmental management waste and qualitative research for the content validity test section, and the 30 households in Hat – Yai City Municipality, Songkhla, Thailand, who understand or be responsible for waste management in their household for reliability result section.

4. Results

4.1 Content Validity Test

Content validity from expert is necessary for reliable model testing i.e. theory development and the indicator verification. Expert selection criteria is academic expertise or high experience about the household hazardous waste. This paper has 7 experts for content validity test in behavior, environmental management waste and qualitative research. The expert examines content validity test between indicators and objective of factors by the Index of item objective congruence (IOC). The answer was measured on 3 – point scales from '-1 = not relate', '0 = I'm not sure' and '1 = relate'. In addition, the expert will recheck the appropriate use of language and content coverage.

Based on the IOC score, the questionnaire that ranged from 0.29 to 1.00. IOC score or have less than 0.50 must be removed for the question of validity. (Cronbach, 1951) The indicator questionnaire was improved based on expert suggestions. The last approach in the content validity test is to recheck household waste management officer in the research area. At the first time, the questionnaire has 189 indicators. Considering form IOC scale, the indicators in the questionnaire decline to 176. After rechecking with formal officer, it remains 165. (Table 4).

Table 4: *Number of item in each factor before and after the examining IOC*

			(number of indicator)	
Factor		**Before IOC**	**After IOC**	**After Formal Officer Checking**
The household				
	Perception	23	20	17
	Social influence	14	13	13
	Optional vision	13	13	12
	Knowledge	11	11	10
The environmental				
	Received knowledge			
	Type of knowledge	10	10	10
	Sources of knowledge	27	27	27
	Experience	18	18	20
	Reinforcement	25	24	23
Intention to act		**13**	**12**	11
Behavior in managing the used dry batteries		**35**	**28**	**22**
Total		**189**	**176**	**165**

4.2 Reliability Test

The target respondents are 30 households in Hat – Yai City Municipality, Songkhla, Thailand. The respondents must understand or be responsible for waste management in their household for reliability result. The survey was administered in person through door–to–door process. The questionnaire consisted of 159 indicators. There are indicators about household and surrounded environment, which related to their behavior in managing the used dry batteries.

The number of indicators consist of Cronbach alpha and Corrected Item-Total Correlation as well as the mean scores for each factor from the first questionnaire set (the original questionnaire set after removing some indicator from IOC validity test). All score are as showed in table 6. The result of Cronbach's α of all indicators was 0.987 from 165 indicators. The reliability is also important to the test characteristic and its data. With that reason, we removed some indicators which showed low correlation. The result of Cronbach's α of all indicator was 0.987 from 142 indicators. (Table 5 and 6)

Table 5: *Number of indicators, Construct reliabilities, and Corrected Item-Total Correlation for the 10 factors (before cut the indicators off the questionnaire)*

Factor	Number of indicator	Mean	S.D.	Cronbach's α	Corrected Item-Total Correlation
The household					
Perception	17	3.19	.628	0.871	0.18 – 0.71
Social influence	13	2.80	.836	0.944	0.56 – 0.86
Optional vision	12	3.02	.676	0.852	0.34 – 0.73
Knowledge	10	0.87	.153	0.583	0.11 – 0.46
The environmental					
Receiving the information					
category of information	10	2.63	.913	0.952	0.60 – 0.92
Sources of information	27	2.26	.809	0.965	0.48 – 0.87
Experience	20	2.24	1.060	0.981	0.70 – 0.94
Reinforcement	23	1.99	1.046	0.989	0.68 – 0.95
Intention to act	11	2.77	.809	0.876	- 0.02 – 0.84
Behavior in managing the used dry batteries	22	2.67	.778	0.926	0.15 – 0.79
Buying	6	3.27	.928	0.833	0.51 – 0.67
Separated and Collected	10	2.37	.962	0.918	0.27 – 0.84
Disposed	6	2.37	.846	0.727	0.16 – 0.63
Cronbach's Alpha	**165**			**0.987**	

Table 6: *Number of indicators, Construct reliabilities, and Corrected Item-Total Correlation for the 10 factors (After cut the indicators off the questionnaire)*

Factor	Number of indicator	Mean	S.D.	Cronbach's α	Corrected Item-Total Correlation
The household					
Perception	13	3.088	.722	0.892	0.46 – 0.72
Social influence	10	2.873	.890	0.948	0.63 – 0.90
Optional vision	10	3.133	.728	0.851	0.46 – 0.68
Knowledge	5	0.900	.215	0.749	0.40 – 0.63
The environmental					
Receiving the information					
category of information	10	2.630	.913	0.952	0.92 – 0.60
Sources of information	27	2.257	.810	0.965	0.48 – 0.87
Experience	20	2.237	1.060	0.981	0.70 – 0.94
Reinforcement	20	1.930	1.066	0.990	0.83 – 0.96
Intention to act	10	2.737	.885	0.901	0.87 – 0.30
Behavior in managing the used dry batteries	17	2.538	.838	0.929	0.83 – 0.33
Buying	6	3.267	.928	0.833	0.51 – 0.669
Separated and Collected	7	2.348	1.083	0.945	0.75 – 0.88
Disposed	4	2.000	1.021	0.873	0.60 – 0.79
Cronbach's Alpha	**142**			**0.987**	

The reliability of factors in questionnaire was ranged between 0.749 and 0.990 for the household and environment factor, and 0.929 for the behavior in managing the used dry batteries. The household factors; Cronbach's α coefficient for the four subscales were 0.892 for perception factor, 0.948 for social influence factor, 0.851 for optional vision factor, and 0.749 for knowledge factor. The environmental factors: Cronbach's α coefficients for the four subscales were 0.952 for category of information factor, 0.965 for sources of information, 0.981 for experience factor, and 0.990 for reinforcement factor, and Cronbach's α of Intention to act factor was 0.901. The Cronbach's alpha score of each factor is highest score.

It can be concluded that most factors showed good reliability. Because the reliability of the scales was tested by Cronbach's alpha's as to confirm good internal correlation of each indicator in the factor. A Cronbach's alpha that stayed above 0.749 indicates good internal reliability (Cronbach, 1951). Therefore, all of the factor in this study can construct the measurement model.

4.3 The Conceptual Framework Model

The result after the recheck of the factors inters - correlation is as in table 7-8. Those factors are the correlations between the constructs, which presented for our conceptual framework model affirmation. It shows that internal consistencies, and inter - correlation of all factor in the conceptual framework model are correlated, with intention to act factor being the most strongly correlated measures, particularly behavior in managing the used dry batteries factor.

The conceptual framework model emphasized all factor with the behavior in managing the used dry batteries. It was found out that there are 2 factors in BH. It was weak from the correlation matrix table, there are 1) The KNOW factor was not almost significantly correlated with the behavior of the used dry batteries. We found out that the KNOW factor was only significantly correlated with BH (Table 8) and all KNOW factor with another factor had negative relationship, and 2) The REC factor was not significantly correlated with BH (Table 7)

Table 7: *Correlation matrix and descriptive statistics of all factors in this study*

	BH	INT	PER	INF	CHO	KNOW	REC	MEDIA	EXP	SUP
Intercorrelation of the scales										
BH	---									
INT	.792**	---								
PER	.437*	.678**	---							
INF	.660**	.766**	.711**	---						
CHO	.596**	.737**	.779**	.845**	---					
KNOW	-.393*	-.350	-.205	-.278	-.159	---				
REC	.196	.366*	.387*	.503**	.377*	-.016	---			
MEDIA	.626**	.654**	.543**	.683**	.530**	-.455*	.633**	---		
EXP	.629**	.677**	.577**	.680**	.534**	-.368*	.393*	.669**	---	
SUP	.502**	.508**	.444*	.528**	.376*	-.433*	.203	.520**	.889**	---
Mean	2.54	2.74	3.09	2.87	3.13	.90	2.63	2.26	2.24	1.93
S.D.	.8382	.88531	.7221	.8902	.7275	.2150	.9132	.8095	1.0602	1.0660
Cronbach's α	0.929	0.901	0.892	0.948	0.851	0.749	0.952	0.965	0.981	0.990
Number	30	30	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).
BH = Behavior in managing the used dry batteries, INT = Intention to act, PER = Perception, INF = Social influence, CHO = Optional vision, KNOW = Knowledge, REC = category of information, MEDIA = Sources of information, EXP = Experience, SUP = Reinforcement

The knowledge factor shows negative correlate with all factor. Moreover, it was only significantly correlated with pro – environmental behavior. It is behavior factor. However, pro – environmental behavior is a behavior, which improves in the environment. With that reason, this

behavior bases on the knowledge of environment and judgment according to the impact on the environment. The knowledge factor still holds in our model.

Table 8: *Correlation matrix and descriptive statistics of the sub – factor in the behavior in managing the used dry batteries factor*

	BH	**BHB**	**BHS**	**BHL**
Inter correlation of the scales				
BH	---			
BHB (Buying)	.729**	---		
BHS (Separated and Collected)	.914**	.529**	---	
BHL (Disposed)	.831**	.324	.710**	---
Mean (M)	2.5381	3.2667	2.3476	2.0000
Standard Derivation (SD)	.83819	.92806	1.08257	1.02132
Cronbach's α	0.929	0.833	0.945	0.873
Number	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

As the conclusion, household behavior in managing the used dry batteries, intention to act and the internal and external factors constructed from the theoretical framework, the operational definition, the expert examination, the reliability, and correlation statistics. The result of correlation shows good correlation. Several results lead to the conceptual framework model of behavior in the management of used dry batteries (Figure 1), which is our objective in this study.

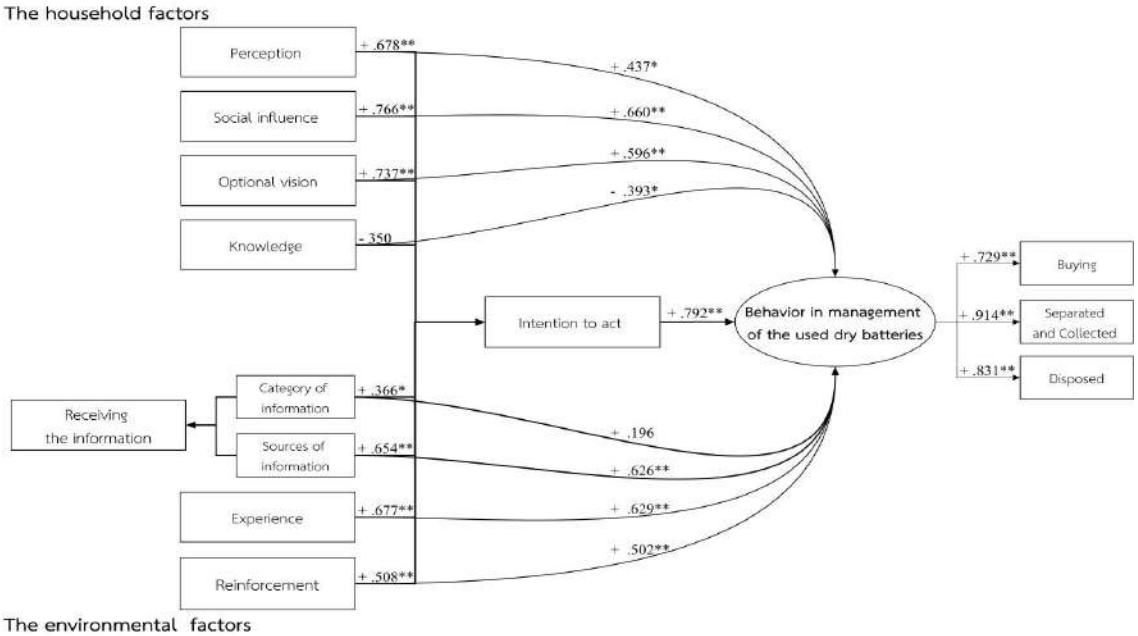

Figure 1: *The Conceptual Framework Model of Behavior in Management Used Batteries*

In this study, it represents a preliminary attempt at concurrently exploring household factor and environmental factor of the used dry batteries management behavior. In addition, the internal, external and intention factor can serve as an alternative factor to explain the used dry batteries management behavior. All factors can assume that a variety of the factor influence the used dry batteries management behavior process.

In this model, it presents the correlations among the observer factors of the used dry batteries management behavior, intention to act factor, perception factor, social influence factor, optional vision factor, knowledge factor, receiving the information factor, experience factor and reinforcement factor. Our results suggest that all factors from theory may help explain consistencies in the used dry batteries management behavior.

5. Conclusion and Discussion

The test from this study is the basic conceptual framework model measurement in the qualitative research. However, it also has important implication for both development and implementation of behavior in managing the used dry batteries to conduct household with confidence action. Because the preliminary conclusion of the study have a good start point for the modeling of the used dry batteries management behavior.

This paper only shows the first part of all in structural equation modeling and calls for measurement model. The measurement scale of a predicting model of the behavior in using dry batteries from household was developed by the step-by-step of the qualitative research approach. The model builds from the general behavior theories and pro - environmental behavior model, and questionnaire develop to previous pro - environmental behavior research, which consider from the level of significant and size of correlation.

In this paper, we have made two important critiques in relation to the indicator selection process in most indicator studies. First, the factors, defined with reference to the theory (Magnusson & Endler, 1977; Ajzen and Fishbein, 1980; Ajzen & Madden, 1986; Burgess et al., 1998 Walsh, Craik, & Price, 2000; Kollmuss & Agyeman, 2002 and Tett & Burnett, 2003) and pro – environmental behavior model (Fietikau & Kessel, 1981; Hines, Hungerford and Tomera, 1987; Kollmuss & Agyeman, 2002; Hansmann, Bernasconi, Smieszek, Loukopoulos, and Scholz, 2006; Latif, Omar, Bidin & Awang, 2012,2013 and Price & Pitt, 2011), were supported.

Second, the selection of all indicators of this paper is generally insufficiently by Hines, Hungerford & Tomera (1987) Biswas, Licata, McKee, Pullig & Daughtridge (2000) Stets and Biga (2003) Promsiri (2001) Amornakarawat (2004) Tonglet, Phillips and Bates (2004) Chaipaitoon (2005) In-Ood (2005) Oreg and Katz-Gerro (2006) Sornsil (2006) Bortoleto, Kurisu and Hanaki (2012) Hou, Al-Tabbaa, Chen & Mamic (2014) Vincent, Renate, Oldrich & Ron (2015) and D'Amato, Mancinelli & Zoli (2016). We examine all indicators by the content validity test and reliability test.

The questionnaire reveal the intent of a given study to participants. All indicators of factors in model, were only marginally influenced by readiness by a social desirability scale. The questionnaire comprised of structured questions relation to the factor in model. The respondents were asked to indicate the extent of their agreement with a number of behaviors relating to the managing the used dry batteries in household. The 5-point rating scales were used throughout the questionnaire.

After that process, quality test questionnaire was used as a content validity method by the experts. Statistical test was used as a reliability testing method. Afterwards, we finally improved the indicator in questionnaire. The last process was to build the measurement model of the behavior in managing the used dry batteries.

This model was designed to identify household hazardous waste management. The suggestions, as a result, specifically addressed the used dry batteries management in household. Moreover, it can also relate to the household hazardous waste management of other materials. Because the indicator in questionnaire was design in particular area, Hat – Yai city municipality, the questionnaire must be changed to context of each area.

The broad goal of this paper was to build the measurement model for preparing for the experimental research of the structural equation model of human behavior in managing the used batteries in household level. This model become the structural model which the relations between latent variables and all factors. The future result of this SEM will suggest that the policy decision making about waste management in each local municipality area research need to be developed, and future research will bring some high influence factor to study in experimental research change behavior in study area. Moreover, the implication of the used batteries from household schemes in accordance with the conditions of the local municipality to be more effective should be identified.

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