Influential factors of water conservation behaviors in household: a case study of con
dominiums in Bangkok, Thailand

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ปัจจัยที่มีผลต่อพฤติกรรมการประหยัดน้ำในครัวเรือน กรณีศึกษาคอนโดมิเนียมในกรุงเทพมหานคร ประเทศไทย

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งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาพฤติกรรมการใช้น้ำและการประหยัดน้ำของผู้อาศัยในคอนโดมิเนียม ในกรุงเทพมหานคร และเพื่อตรวจสอบปัจจัยที่ส่งผลต่อความตั้งใจในการประหยัดน้ำ ระหว่างตัวแปร ทัศนคติ, บรรทัดฐานสังคม, ความสามารถในการควบคุมพฤติกรรมและการรับรู้ข้อมูล กลุ่มตัวอย่างที่ใช้ศึกษาคือผู้อยู่อาศัยในคอนโดมิเนียม ในกรุงเทพมหานคร จำนวน 210 คน ซึ่งทำการเก็บแบบสอบถามระหว่างเดือนมกราคมถึงเมษายน พ.ศ. 2561 การวิเคราะห์ข้อมูลทำโดย การใช้สถิติแบบพรรณนาเพื่อเข้าใจถึงพฤติกรรมการใช้น้ำและการประหยัดน้ำ และการวิเคราะห์ด้วยแบบจำลองสมการโครงสร้างเพื่ออธิบายปัจจัยที่มีผลต่อการประหยัดน้ำที่ทำทุกวันและการติดตั้งอุปกรณ์ประหยัดน้ำ ผลการวิจัยพบว่าสองพฤติกรรมประหยัดน้ำที่ทำเป็นประจำบ่อยที่สุดคือการปิดก๊อกน้ำสนิททุกครั้งและการกวาดเศษอาหารทิ้งทุกครั้งก่อนล้างจาน นอกจากนั้นผลการวิเคราะห์แบบจำลองสมการโครงสร้างแสดงให้เห็นว่าความสามารถในการควบคุมพฤติกรรมส่งผลต่อความตั้งใจในการประหยัดน้ำที่ทำทุกวัน ส่วนทัศนคติและการรับรู้ข้อมูลนั้นส่งผลต่อความตั้งใจในการติดตั้งอุปกรณ์ประหยัดน้ำ ผลจากงานวิจัยนี้สามารถเพิ่มความเข้าใจเกี่ยวกับแรงจูงใจในการประหยัดน้ำและการติดตั้งอุปกรณ์ประหยัดน้ำ ซึ่งเป็นประโยชน์ต่อการวางแผนและพัฒนาแนวคิดการบริหารจัดการด้านความต้องการการใช้น้ำให้เกิดประสิทธิภาพต่อไปในอนาคต

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Sutida Sirimungkla : Influential factors of water conservation behaviors in household: a case st udy of condominiums in Bangkok, Thailand. Advisor: Assoc. Prof. CHANATHIP PHARINO, Ph.D.

This study aims to investigate water use and water conservation behaviors of people in condominiums in Bangkok, Thailand, and to determine the most influential factor to the behavioral intention, among attitude, social norm, perceived behavioral control (PBC), and information effect. A questionnaire survey of 210 respondents was conducted in Bangkok Metropolitan area between January – April, 2018. Data was analyzed by descriptive statistic to investigate water conservation behaviors and Structural Equation Model (SEM) to examine the determinants of intention to perform the everyday water conservation behaviors and to install water saving devices. The results indicate that two top practices rate related to everyday water conservation behaviors are (1) making sure that the tap not drip and (2) cleaning food scrapes before dish washing. Most of residents have installed dual-flush toilet in their household. Essentially, the SEM result reveal PBC affects significantly on intention to everyday water conservation behaviors. And attitude and information effect have influence to install water saving devices. The results from this study increase an understanding about key factors affecting the motivation of water conservation behaviors. This is helpful to develop effective water demand management strategy and future policy.

Field of Study:	Environmental Engineering	Student's Signature ....
Academic Year:	2018	Advisor's Signature ....

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Sutida Sirimungkla

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CHAPTER 1

INTRODUCTION

1.1 Thesis Topic

Thai ปัจจัยที่มีผลต่อพฤติกรรมการประหยัดน้ำในครัวเรือน กรณีศึกษา คอนโดมิเนียมในกรุงเทพมหานคร ประเทศไทย

English Influential factors of water conservation behaviors in household: a case study of condominiums in Bangkok, Thailand

1.2 Keyword

Water Conservation behaviors; Theory of planned behavior (TPB); Condominium; Structural Equation Model; Water demand side management

1.3 Background and Significant of problems

Increasing urban water demand is due to urbanization, rapid economic growth, and industrialization. According to Thailand Metropolitan Water Authority (MWA) annual report, there was a rise of approximately 15 percent of water distribution between year 2007-2015 relating to around 4 percent of population growth. In addition, household sector was the majority of water user, approximately more than 50 percent, among other sectors, business, government and state enterprise, industries, and public water and others. At the same time, the number of high-rise condominiums in Bangkok Metropolitan is also expanding. From 2010 to 2015, the accumulated number of condominiums was around 233,793 units. (Department of land, 2015) Furthermore, the prediction water consumption rate from multiple linear regression equation in Bangkok Metropolitan Area (Bangkok, Samutprakarn, Nonthaburi) will be an increase around 7-12% in 2019 (Phiw-ngam, 2009). Recently, Bangkok Metropolitan was hit by drought in July 2015 which caused by the critically low water level in the three reservoirs (Prasak Dam, Kra-Seiw Dam, and Thab-Sar-Lea Dam) supplying to Bangkok's Water Treatment Plant. The water could be last for 30 days and the water-work officials asked Bangkok residents to reserve more water in their houses. As a result, managing this unreliable water resource is serious challenge for policy makers. To address water security issue management both of supply and demand side must be considered.

Management of water demand side should be a practical approach to deal with limited and unreliable water resource, epically in the changing climate risk. The concept of water demand management is to concentrate on water use behaviors by promoting efficiency of water use and adapting patterns of water use. For example, measures for reducing water consumption, water awareness campaign, and incentive of using water-saving devices should be provided as policy recommendations and implementation (Da-ping, Hong-yu, & Dan, 2011). Jorgensen, Graymore, and O'Toole (2009) pointed out that incentive (tariff structure and rebate program), regulations (local government planning), household feature (household income, water saving technology), and person traits (intention and knowledge of how to conserve water) are identified as direct drivers of water conservation behaviors. Moreover, Hurlimann, Dolnicar, and Meyer (2009) suggested the existing gaps in demand-side solutions researching that require more investigation in water related actual behaviors, water behaviors through demand-side management, and influencing psychosocial factors on behavioral intentions and behaviors.

There have been a number of water use studies in Thailand that focused on socio-demographic factors such as age, gender, and educational levels etc. Pingkusol (2003) study in Khon Kaen Municipality reported that water bill, number of household members, income, and location influenced of water use behaviors. Phiw-ngam (2009) found that the major factors including total population, total precipitation, size of family, average selling price, and income per capita effect to quantity of water use.

However, psychosocial factors such as subjective norm, environmental attitude, and perceived behavior control based on theory of planned behavior (TPB) have not been investigated and understand widely yet. The TPB was widely acceptable in order to predict human behaviors relating to environmental actions, for instance waste prevention behaviors, improving energy efficiency behaviors, and conservation of natural resource behaviors etc. (Icek Ajzen (1991); Bortoleto, Kurisu, and Hanaki (2012); Steg and Vlek (2009))

To introduce effective water demand management policy in Thai communities, it is essential to investigate factors that impact how citizens make decision and which factors can have high influence. The purpose of this study is to investigate and understand factors that influence water conservation behaviors in household. The scope of research focuses on residents living in condominium in Bangkok. The study will examine both social and research perspectives to have impact on water use behaviors and decision. Consequently, ability to identify and understand the impact factors rigorously, can be helpful for the design and development of water demand management strategies.

CHAPTER 2
PURPOSE AND SCOPE OF THESIS

2.1 Purposes of the thesis

1. To examine and analyze water use and water conservation behaviors in condominiums
2. To identify influential factors to water conservation behaviors in condominiums

2.2 Hypotheses

1. Subjective norm has more influence on water conservation behavior than attitude toward behavior and perceived behavior control.

2.3 Scope of the thesis

1. Condominiums in Bangkok Metropolitan area are selected as a case study
2. This research investigates water conservation behaviors in household that focus on only indoor activities including toilet, washing machine, showers, bathtub, and kitchen sink.
3. The water conservation behaviors will be classified in two group behaviors, namely (a) everyday water conservation behaviors and (b) adopting water saving devices.

2.4 Expected outcomes

1. Understanding of how people in condominium perform water use and water conservation behaviors.
2. Identification of the most influential psychosocial factors of water conservation behaviors for condominium's residents in Bangkok.
3. Better understanding on water demand side management in household sector.

CHAPTER 3
LITERATURE REVIEW

This chapter reviews about water demand and supply situation in Bangkok, Thailand, water demand management strategies, and water use and conservation behaviors in Thailand and other countries. Moreover, theory of planned behavior (TPB) and application of the theory to the principle of a research framework are also described.

3.1 Water demand and supply situation in Bangkok, Thailand

Bangkok, is the capital city of Thailand, is covering the total area of 1,569 square kilometer which is a high growth of urbanization, roughly 60 percent of land built-up. According to Babel, Rivas, and Kallidaikurichi (2010), the agriculture area is approximately 29 percent which is mostly located in an outer edge of the city and the aquaculture is around 5 percent when the water bodies is only 1 percent. In addition, Bangkok has a monsoon climate which has three seasons: rainy season (May - October), cold season (November - January), hot season (February - April) and the average annual rainfall is approximately 1500 mm from 1971 to 2000.

In Bangkok, the Metropolitan Waterworks Authority (MWA) provides water supply for two types users involving residential and non-residential users which water tariff structure is demonstrated as Table 3.1. Raw water was extracted from two water sources, the Chao Phraya river at Pathumthani province and Mae Klong dam at Kanchanaburi Province which water flow is about 60 and 45 m^3/s, respectively. However, according to the revised MWA master plan, MWA concerns that the 105 m^3/s of water allocation at the present would be adequate until 2030 so that MWA require to find alternative water sources to serve increasing demand in the future. Moreover, MWA has main four water treatment plants including Samsen, Thonburi, Bangkhen, and

Mahasawat. The total water production capacity is 5.92 million cu.m/day while the total water production is 5.55 million cu.m/day as claimed in MWA annual report 2015. The raw water is treated by conventional process which consists of pumping station, coagulation, flocculation, clarifier, chlorination, and filtration. And before distribution through consumers, treated water is pumped to surge tank, pumping station in order to increase water pressure that retaining the average water pressure in the whole piping system at 59 kPa.

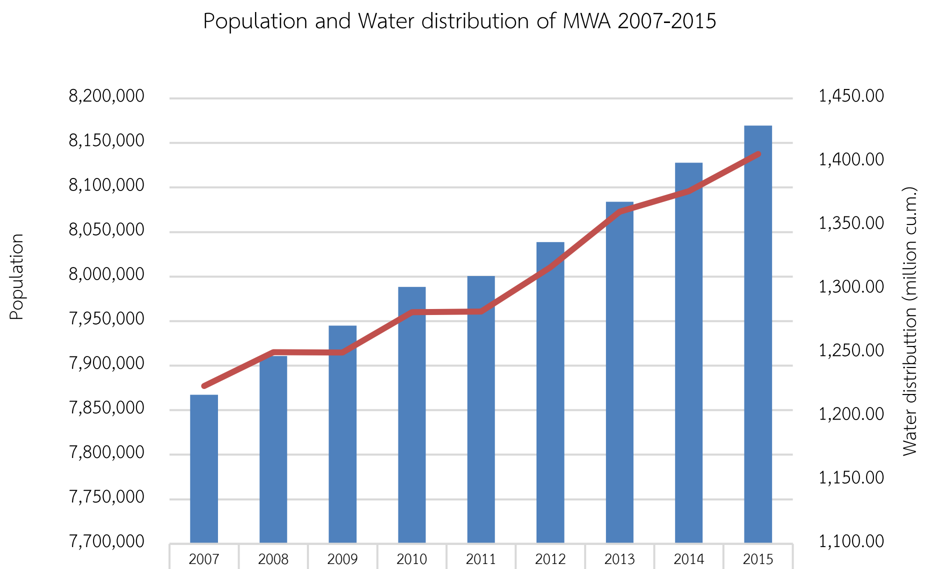
Table 3.1 Water Tariff of MWA Source: Metropolitan Waterworks Authority (2015)

Type 1: Residence		**Type 2: Commerce, government agency, state enterprise, industry, others**	
Volume (CU.M)	Water Tariff (Baht/ CU.M)	Volume (CU.M)	Water Tariff (Baht/ CU.M)
0-30	8.50	0-10	9.50 (not less than 90.00 baht)
31-40	10.03	11-20	10.70
41-50	10.35	21-30	10.95
51-60	10.68	31-40	13.21
61-70	11.00	41-50	13.54
71-80	11.33	51-60	13.86
81-90	12.50	61-80	14.19
91-100	12.82	81-100	14.51
101-120	13.15	101-120	14.84
121-160	13.47	121-160	15.16
161-200	13.80	161-200	15.49
More than 200	14.45	More than 200	15.81

Bangkok metropolitan area is fast urbanization, according to the World Bank Report East Asia's Changing Urban Landscape: Measuring a Decade of Spatial Growth (2015), it demonstrated that Bangkok was the most dominated urban area in Thailand growing from 1,900 square kilometers to 2,100 square kilometers from 2000 to 2010, which the growth rate was 1.1 percent per year. Considering the growth of urban area in Thailand between 2000 and 2010, 22 percent was in Bangkok, whereas 26 percent occurred in Samut Prakan, 15 percent in Nakhon Pathom, and 11 percent in Phra Nakhon Si Ayutthaya. Moreover, there was approximately 7,000 people per square kilometers of urban population in Bangkok which was higher than other areas. As high concentration of population in Bangkok area, the demand of residences also increases, especially high-rise condominium in this urban area. As shown in Table 3.1, the total number of units in condominiums is 435,933 in Bangkok area, while 438,432 in other provinces, although Bangkok area is around 1,500 square meters. It seems that Bangkok has very high-density residential area. Additionally, investment in expansion of public transport system enhances an increasing of condominium in Bangkok area following by train line. The development of public train transport system has 10 main lines covering Bangkok area and perimeters which are expected to be a solution for traffic congestion, to be convenient for commuters, and to decrease time travel. Moreover, a result of severe flooding occurred in Bangkok 2011, condominium demanding in inner Bangkok (Lumpini, Ploenchit, Silom, Sathorn and Sukhumvit districts) has raised because the condominiums are in higher protection areas from flood damage and the building designer also confirmed that the condominiums have been designed to prevent flood damage in the near future.

Higher population causes higher water consumption as same as the current situation of water demand in Bangkok and adjacent provinces, Thailand as shown in Figure 3.1. The information presented the similarity of upward trends between official residents in Bangkok, Nonthaburi, and Samutprakarn, Thailand and water distribution of metropolitan water authority (MWA) from 2007 to 2015. The average increasing rate per year of the population was approximately 4 percent, at the same time the rising rate of water distribution was around 14 percent.

Figure 3.1 The amount of registered population in Bangkok, Nonthaburi, and Samutprakarn, Thailand and water distribution of metropolitan water authority in 2007-2015 (Source: official statistic of registration system, 2017 and metropolitan water authority report 2007-1015)



	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total popu (people)	7,867,379	7,910,699	7,944,771	7,988,317	8,000,693	8,038,535	8,084,133	8,127,684	8,169,430
water dist. (million cu.m.)	1,224.00	1,250.60	1,250.30	1,281.90	1,282.40	1,317.30	1,361.00	1,377.20	1,406.30

Table 3.2 Statistic of registered condominium in Bangkok between 1998 and 2017 (Source: Department of land (2015))

Year	Bangkok		Other Provinces	
	Condominium	Unit	Condominium	Unit
1998	129	21,046	109	14,054
1999	53	7,639	28	2,147
2000	60	5,750	30	1,426
2001	21	4,561	30	3,725
2002	33	5,896	9	784
2003	50	7,115	17	2,739
2004	60	8,057	44	2,252
2005	81	10,234	61	3,834
2006	103	13,717	262	10,580
2007	93	15,321	96	6,976
2008	198	24,605	253	12,470
2009	220	28,817	534	26,572
2010	278	39,793	398	21,988
2011	183	29,055	190	10,900
2012	177	28,949	815	45,157
2013	371	50,602	752	51,597
2014	421	44,208	874	63,967
2015	178	41,186	724	76,243
2016	75	16,339	403	45,832
2017	127	33,043	377	35,189
Total	2,911	435,933	6,006	438,432

To achieve a sustainable lifestyle, reducing water use in household at source is necessary to implement the water demand policy. More understanding of water use pattern in household can be beneficial for a water demand management plan. Water use in household can be divided into two components: indoor and outdoor water use. In case of condominium, it can be assumed that daily water use mainly relates to indoor water use because of limitation of functional spaces, whereas water use for detached house focuses both indoor and outdoor water use. According to the recommendation of work manual for estimation water demand for any sectors: household, industrial and tourist service, agriculture, and ecology system (Royal Irrigation Department, 2011), the report suggested that for city municipal area, water demand was 250 liters per capita per day, for sub-district municipal area, water demand was 50 liters per capita per day, and for outside municipal area, water demand was 120 liters per capita per day. It can be implied that the amount of water demand depends on characteristic of area and different activities. Considering to indoor water use in household, it includes toilet, shower and bath, washing machine, dishwashing, and taps. Some experts conducted surveys of micro-component of residential in Thailand. Residential water use in Bangkok was studied in 1996 (Little, 1996 as cited in Otaki, Otaki, Pengchai, Ohta, and Aramaki (2008)) as the results in Table 3.2 showing that total water consumption was 217 liters per day-capita including toilet, bath and shower, laundry, kitchen, loss, and other. The largest water use was for toilet, 31 liters per day-capita, whereas the smallest water use was for kitchen, only 4 liters per day-capita.

Furthermore, Otaki et al. (2008) measured micro-components of water consumption in Chiang Mai, Thailand which is the central city of northern area of Thailand and found that total water use was 77 liters per capita per day which micro-components water use are shown in Table 3.3. The authors also estimated water use in the future in two situations. Firstly, in normal situation, the total water use would be 152 liters per capita per day, water use increased for applying flush toilet (from 4 liters per use to 10 liters per use) and automatic washing machine (100 liters per use to 150 liters per use). Secondary, water-saving devices adoption situation, the overall water consumption would be 131 liters per capita per day, water use for toilet and laundry decreased because of water conservation flush toilet and water saving washing machine, compared with the first scenario.

Table 3.3 Micro-components of residential water use in Bangkok (Little, 1996 as cited in (Otaki et al., 2008))

Total	Liter/capita/day
Toilet	31
Bath and Shower	78
Laundry	52
Kitchen	4
Loss	24
Other	28

Table 3.4 Water use estimation (liter per capita per day) (Otaki et al., 2008)

	Present	Water Consciousness scenario	Usual scenario
Toilet	15 (13%flush, 87%pail)	20 (100% flush)	31 (100% flush)
Laundry	18 (mainly twin-tub)	16 (fully automatic)	27 (fully automatic)
Bath	25	75 (Singapore level)	75 (Singapore level)
Kitchen	19	19	19
Total	77	131	152

In domestic sector, indoor water conservation involving with flush toilet, shower and bathing, basin tabs, dishwashing machine, and washing machine can be encouraged by installing water saving appliances that can be recognized by labeling. On the one hand, approving by Thai environmental institute, this label is applied to the product that is friendlier to the environment than others, comparing to the same product category for consumers to have more alternatives of water appliances to choose. On the other hand, Thai Industrial Standard Institute, the national standards organization for Thailand having official permission to set national standards and certify industrial products, established water saving product standard including shower units and faucets for sanitary wares. The description of these water saving products is shown in Table 3.4. To select water saving products, the customers can recognize them by the label on the products' packaging and the number of water consumption presented in the catalogue. Moreover, Metropolitan Waterworks Authority cooperating with Provincial Waterworks Authority encouraged entrepreneurs of sanitary ware to realize the environmental situation and to provide innovative products with higher water efficiency. They launched the campaign "Save water…You make it" in order to support and stimulate the sanitary wares to approve the Green label by Thai Environmental Institute and promoted these green label products to be wildly used.

There is a Thai company that concern about a finite resource as water and sell products that are friendly to the environment. Neonine Intertrade company limited promote a sell of water saving products: tap aerator, shower flow minimizer as a brand of "Greennio". The tap aerator is a purpose to reduce water use by increase spray system which an application for a faucet in a bathroom and a kitchen. The shower flow minimizer is also to decrease water flow by a new technology with consistent outflow of water.

Table 3.5 Water saving equipment and requirement of water consumption of Green label products (Thailand Environment Institute (2011)and (Thailand Industrial Standard, 2009)

Water Equipment	Water consumption (Thailand environment institute)	Water consumption (Thai industrial standard)
1.Faucet	TGL-11-R2-11	TIS.2067–2544
Basin & kitchen Faucet	< 4.8 liter/min at pressure 0.1±0.01 MPa	0.5 liter/min < Q < 6.0 liter/min at pressure 0.1 MPa and maximum working pressure 0.75 MPa
Automatic faucet	< 0.32 liter at time > 2 second at pressure 0.1, 0.2, 0.3 MPa	Q max < 0.6 liter at time > 2 second, Q avg < 0.4 liter at time > 2 second at working pressure 0.1-0.3 MPa, pressure $_{min}$ 0.1 MPa and pressure $_{max}$ 0.75 MPa
Rinsing Spray	< 5.0 liter/min at pressure 0.1±0.01 MPa	-
2.Shower	TGL-11-R2-11	TIS. 2066-2552
Fixed Shower	< 7 liter/min at pressure 0.1±0.01 MPa	0.5 liter/min < Q < 9.0 liter/min at pressure 0.1 MPa
Hand Shower	< 6.5 liter/min at pressure 0.1±0.01 MPa	0.5 liter/min < Q < 8.0 liter/min at pressure 0.1±0.01 MPa

Water Equipment	Water consumption (Thailand environment institute)	Water consumption (Thai industrial standard)
3.Dish washing machine in household	< 1.2 liter/ place setting	-
4.Clothes washing machine		
Top Load Washing Machine	< 22 liter/ 1 kilograms of clothes	-
Front Load Washing Machine	< 9 liter/ 1 kilograms of clothes	-
5.Toilet	TGL-5-R3-11	TIS. 792 - 2554
Single flush	< 4.8 liter/ 1 use	< 6 liter/ 1 use
Dual flush	< 4.5 liter/ full flush < 3 liter/ reduced flush	< 6 liter/ full flush < 3 liter/ reduced flush

3.2 Water demand side management

Due to increasing of population and urban water demand, for instance in Bangkok, Thailand as shown in Figure 3.1, this causes of low water security that water supply cannot serve the community with adequate quantities and standard quality. Water supply management as conventional approaches to provide facilities or infrastructures using limited water resources drives to over consumption, pollution, and other environmental challenges (Sharma & Vairavamoorthy, 2009). Therefore, water demand management (WDM) seems to be a sustainable strategy to confront the increasing water demand which can be explained as methods or techniques to achieve decreasing the amount of water use focusing on water end-users. The new operational definition of water demand management is concluded by (Brooks, 2006) in five parts as follow:

(1) Reduce the quantity or quality of water required to accomplish a specific task.

(2) Adjust the nature of the task or the way it is undertaken so that it can be accomplished with less water or with lower quality water.

(3) Reduce the loss in quantity or quality of water as it flows from source through use to disposal.

(4) Shift the timing of use from peak to off-peak periods.

(5) Increase the ability of the water system to continue to serve society during times when water is in short supply.

Based on these five elements of WDM definition, the main achievement is to conserve water use or minimize water consumption. The author also pointed out that WDM is to promote decentralized approaches to household level which involve both behaviors and technology. However, to succeed in this demand management, it needs active cooperation of stakeholders including policy makers, water managers, government agencies, public, and others in order to generate and develop practical implementations and effective plans.

Water demand management instruments can be divided in five groups: (1) financial, (2) technological, (3) legislative, (4) operational and maintenance, and (5) educational proposed by Inman and Jeffrey (2006). The different five categories of WDM tools are described as below.

Firstly, such tool is financial tool, refers to pricing structure. It seems to be the most popular mechanism to significantly impact water consumption behaviors. Elastic pricing is referred to exactly water demand that is responsive to marginal price of water, so raising in water pricing may create a disincentive to diminish water demand. In the United States, an expert claimed that increasing of 10 percent in water tariff can be possible to decrease 3-4 percent of water consumption (Olmstead & Stavins, 2009). Nevertheless, to effectively generated water pricing structure, not only detailed information on water users (household income, household size) but also weather condition must be concerned. The current water tariff structure of MWA is a progressive rate shown in Table 3.1 which has been implemented since 1999. As this lower water rate, 0-30 cu.m of residential user has the water rate is only 8.50 baht per cu.m, the price does not reflect the marginal cost of water production. For example, the average marginal cost of water was approximately 12.00 -12.02 baht per unit between 2013 and 2016. Nonetheless, the government claimed that keeping this lower water tariff would support poor people who has household income lower that 8,000 baht monthly to have an access on safe and standard water. (Babel et al., 2010)

Secondly, technological tool relates to installation of water saving appliances which consists of two programs. Firstly, household retrofit program is addition a new feature to an old system, for instance, the Save-a-Flush is an absorbent plastic bag that is dropped into toilet tank and expands to substitute for some spaces that generally filled up by water. As a result, this bag will save around one liter of water for each flushing. Another program involves a permanent replacement of highly efficient water saving devices, for example low flow shower head, dual-flush toilet, water saving clothes washer etc.. As indicated by Inman and Jeffrey (2006), it was claimed that 9-12 percent of water use can reduce by retrofit program, while 35-50 percent can also diminish by installation of high efficient water appliances. Moreover, Willis, Stewart, Giurco, Talebpour, and Mousavinejad (2013) pointed out that combination of installation of water efficient shower head, washing machine, and rain water tank had a potential to save water consumption, approximately 33 percent. In Thailand, the technological mechanism had a support by labelling of water efficient fixtures and appliances proved by Thailand Environment Institute and Thai Industrial Standard as shown in the previous section.

Thirdly, legislative and regulatory approaches are command and control measures that used to enforce and encourage all engaging stakeholders involved in urban water management system to adopt related behaviors. For example, laws, licenses, permits, registration, administrative guidelines, codes of practices, standers, etc.. Although these regulatory tools are clear goals and compliance with common sense, these tools include complicated monitoring procedures and no incentive to change behaviors. Nonetheless, these tools are a core framework for water demand management that need to integrate other instruments including price and non-price mechanisms and all public/private stakeholders to implement the laws. In Thailand, with an agriculture-based country, the emphasis of water resource allocation would be on the farming activities by encouraging supply side management in order to increase productivity in the past. However, the higher population increase, the larger water demand. Confronting water disasters such flooding, shortage, and pollution etc.

Thus, Thailand need to develop national water policy to addressing these challenges. Nevertheless, at the present, Thailand has no water law policy, however, the draft of national water management law and policy is on progress to be approved by the water law committee. According to a review of existing regulation on water resource management, it seems to be that water resource management plan still have significant gaps and a lack of unity and clear measures of water allocation. Besides, water resource is out of control. Everyone has an unrestricted access to the water resource, as a consequence of "tragedy of common", especially water use for agricultural sector, in case of rice farming. (Mingsarn et al., 2002)revealed that in the same water basin, there was different of water use efficiency and the lowest profit per water unit in lower Chao Phraya basin, comparing to other projects. Therefore, it is a necessity to provide effective water management plan and policy for all stakeholders. Mingsarn Kaosa-ard et al., 2002 also proposed the guideline on water allocation by providing water right, identifying water users' priority, as well as the recommendation for setting new water tariff in order to increase water efficiency in domestic and non-domestic users.

Fourthly, without operation and maintenance for the water supply system can bring about a huge loss of water resulting in pressure, supply, and financial damage that so-called non-revenue water (NRW). The major cause of water leakage is a problem of an old and broken distribution system which can ultimately resolve through replacement program. Also, SCADA technology is properly installed to control and monitor water flow and water pressure. Other causes are malfunction of water meter and illegal water connection. To repair the old system may take a huge financial investment, but the overall outcome can significantly minimize non-revenue water in the supply system.

Finally, educational approach aims to inform helpful knowledge that influence to perform water conservation behaviors. Generally, someone should know how the activity can be done or what effect of the activity is before taking an action so that detailed knowledge must be provide. (Kaiser & Fuhrer, 2003) have divided the form of knowledge impacting environmental behaviors in three categories. One form is called declarative knowledge. It mentions to the fact of an environmental system, for instance, it is acknowledged a fact that the major cause of ozone depletion is man-made chemical substances e.g. chlorofluorocarbon (CFCs), HCFCs, Freons, Halons. A second form is related to procedural knowledge that demonstrate how to perform the ecological actions. It refers an explanation of processes and measures to conduct behaviors, for example, to get rid of an obsolete personal computer, the information would provide the place of hazardous waste collection center in order to drop off the old computer. The final form accounts for effectiveness knowledge, usually concern about the potential consequences of the behaviors. For example, reduce or reuse the plastic can have a great impact on decreasing of solid waste. To achieve actions toward environmental behaviors, three forms of knowledge must be merged to come across psychological obstacles. The key component for educational program is to clearly communicate about water conservation information to the targeted consumers. The important water conservation behaviors/ techniques must be contributed to all stakeholder including users and manages. Indeed, water conservation practices, the concerned behaviors can be categorized in two different sets. First, high efficiency of water use is concerning involving employing water efficient appliances in household such as aerator faucets, low-flow flush toilet, or rain retention tank. Next, water saving activities are considered as the activities that decreasing the water quantity such as the water conservation behaviors in household recommended by US Environmental Protection Agency (US-EPA) in Table 3.6.

Table 3.6 Conserving water behaviors recommended by US-EPA (Collected by Kurisu (2015))

No.	Conserving water behaviors
1	Don't let the water run while shaving or brushing teeth
2	Take short showers instead of tub baths
3	Scrape, rather than rinse, dishes before loading into the dishwasher; wash only full loads
4	Wash only full loads of laundry or use the appropriate water level or load size selection on the washing machine
5	Buy highly efficient plumbing fixtures and appliances
6	Repair all leaks (a leaky toilet can waste 200 gallons a day)
7	Water the lawn or garden during the coolest part of the day (early morning is best)
8	Water plants differently according to what they need. Check with your local extension service or nurseries for advice
9	Set sprinklers to water the lawn or garden only – not the street or sidewalk
10	Use soaker hoses or trickle irrigation systems for trees and shrubs
11	Keep your yard healthy – dethatch, use mulch, etc.
12	Landscape using "rain garden" techniques to save water and reduce storm water runoff

In summary, water demand management is described as approaches and/or techniques carried out to reduce the amount of water use, used as a substitute for water conservation (Russell & Fielding, 2010). According to Clark and Finley (2007), the residents in Blagoevgrad, Bulgaria confronted water shortage during summer and fall in 2000, they had been restricted to use water only two to three hours a day. The authors suggested the water conservation plan would be possible solution to tackle with this problem instead of finding new water resource and constructing supply storages. Moreover, the European commission was also agreeable to support the promotion water conservation habits and water efficient technologies across region of Europe (Perren & Yang, 2015). Consequently, the main factor of successful water demand management policy would be adaptation of consumers' water use behaviors. The perspective of psychology in connection of water use/ conservation can make the contribution of understanding the influential factors on water demand. Furthermore, the policy-makers can implement effective management plan based on research evidence.

3.3 Water use and conservation behavior in Thailand

There were some studies about water use behaviors and quantity of water consumption. First, Chalerm Rat-asa (2007) investigated the behaviors of using water supply in Nakorn-Ratchasima local municipality using a questionnaire and an interview for data collection. The finding of water use activities shown that more use flushing toilet that squatting toilet, more use of shower and bowl that bathtub, using washing machine, using rubber-tube to wash a car. In term of water conservation behaviors, they also performed these behaviors: turn off the tap while brushing teeth or washing with soap, clear off the food before cleaning, always check the sanitary fixtures for leakage and repair them immediately, and reuse water from cleaning clothes and dishes for plants watering. This research also revealed the water consumption in different types of household as follow: for single house-one storey, 0.78 cubic meter/ household/ day, single house-two storey, 0.87 cubic meter/ household/ day, building or commercial building, 0.63 cubic meter/ household/ day, town house, 0.67 cubic meter/ household/ day, rent room, 0.33 cubic meter/ household/ day.

Furthermore, Otaki et al. (2008) had compared indoor micro-components of water use toilet, laundry, bath, and kitchen between Chiang Mai and Khon Kaen. The composition of water use quantity as follow in Table 3.7.

Table 3.7 residential indoor water consumption patterns in Chiang Mai and Khon Kaen, Thailand (Otaki et al., 2008)

Water use	**Chiang Mai** (Liter per capita per day)	**Khon Kaen** (Liter per capita per day)
Toilet	16.4	9.8
Laundry	18.7	16.3
Bath	22.8	23.7
Kitchen use	16.3	13.5
Total	74.2	63.3

The researchers have examined the affecting factors of sociodemographic to water consumption behaviors. For example, Wannee Wuttiwongsumpun (1998) examined using water supply behaviors of consumers under metropolitan waterworks authority service. The author found that gender, occupation, education, household size had influence on water use behaviors. Moreover, Noree (2008) carried out a survey of water use for residents in metropolitan waterworks authority service and pointed out that there was significant relationship between sociodemographic factors: gender, occupation, average household income and water use behaviors.

Sompit Khumpaniad (2008) studied the relationship of water service charges and water use behaviors on the metropolitan waterworks authority of Nonthaburi branch discovered that gender, age, occupation, income, and type of water service were correlation to water use behaviors. Furthermore, Pingkusol (2003) studied affecting factors to the quantity of household water use for Khon Kaen Municipality and demonstrated that average water pricing, household size, household income, and household area had direct determined water use.

A number of studies have measured the level of knowledge on water use or conservation. Wannee Wuttiwongsumpun (1998) pointed out that people in the metropolitan area had high score of water resource and water supply knowledge. They usually received information through newspaper. The further study also shown the high level of water conservation knowledge of metropolitan residents, however, the source of information had changed to be television (Noree, 2008). It can be implied that the communication of technology had an influence on people lifestyle of information receiving. In addition, Kanittha Keawkool (2004) examined water conservation behaviors level and influencing factors to the behaviors of water users of Rangsit Provincial waterworks service. He revealed that knowledge of household water conservation approaches, and knowledge of water use efficient had significant influences on water conservation performance.

Besides, an author reported level of water use attitude related to water conservation (Nattachai Surongdecha (2001)) The results shown that people had moderate level of water conservation attitude which including 4 viewpoints of attitude: acknowledge for water saving method, complexity of water saving method, the benefit of water conservation, changing to water conservation behavior and had medium of water conservation knowledge. Moreover, education level, income, level of acknowledge had significant effect to water conservation attitude.

As mentioned above, there were many researches about water use and water conservation in Thailand which were studied in different viewpoints, nonetheless based on these previous reviews, there were likely not many studies on a relationship between water conservation behavior and other affecting factors such as psychosocial factors and information effects. Therefore, to establish new understanding, further researches should be done.

3.4 Theory of planned behavior and applications

Icek Ajzen (1985) modified the theory of planned behavior (TPB) from theory of reasoned action (TRA) (A. Fishbein and Ajzen (1975)) to improve limitation that TRA could work well when involved with voluntary behaviors, however TPB could be suitable when applied with the behavior that was non-volitional control. TPB was more effective to explain some factors that cannot control by people's intention, such as their skills, resources, knowledge, and time, than TRA. Yet, both theories still focused on the main variable that was intention to perform the given behavior.

A. Fishbein and Ajzen (1975) created TRA to understand humans' behavior and assumed that behavior directly influenced by intention. The intention was effect of two factors; attitude toward behavior and subjective norm as shown in Figure 3.1. First factor, **attitude toward behavior** referred to positive or negative feeling to the given behavior and produced by behavioral belief that related to belief in person's attitude toward behavior and evaluation of behavior's consequence that associated with potential result of the behavior. For instance, if people were encouraged to lose their weight (behavior), they might believe that losing weight could make them get healthy and live longer (behavioral belief and outcome evaluation). And, the high degree of favor about losing weight (attitude) could lead them to lose weight. Next, subjective norm was defined as perception of others' expectation to perform the behavior and consideration of social pressure to do or not to do the behavior.

Moreover, **subjective norm** was generated from normative belief that relates to individuals' perception of a significant referents and motivation to comply with referents' expectation. The referents must be important people such family members and friends. For example, children were pressured to clean their room everyday (behavior) because their parent (referents) thought that it was necessary, and the children perceived that parents' thought was acceptable (normative belief) and agreed to perform that behavior everyday (motivation to comply). With these two determinants, they could generate subjective norm which was capable to influence intention of behavior. As mentioned above, TRA suggested that limited only the given behavior under volitional control. To predict non-volitional behavior, the extension of TRA is concerned to discuss.

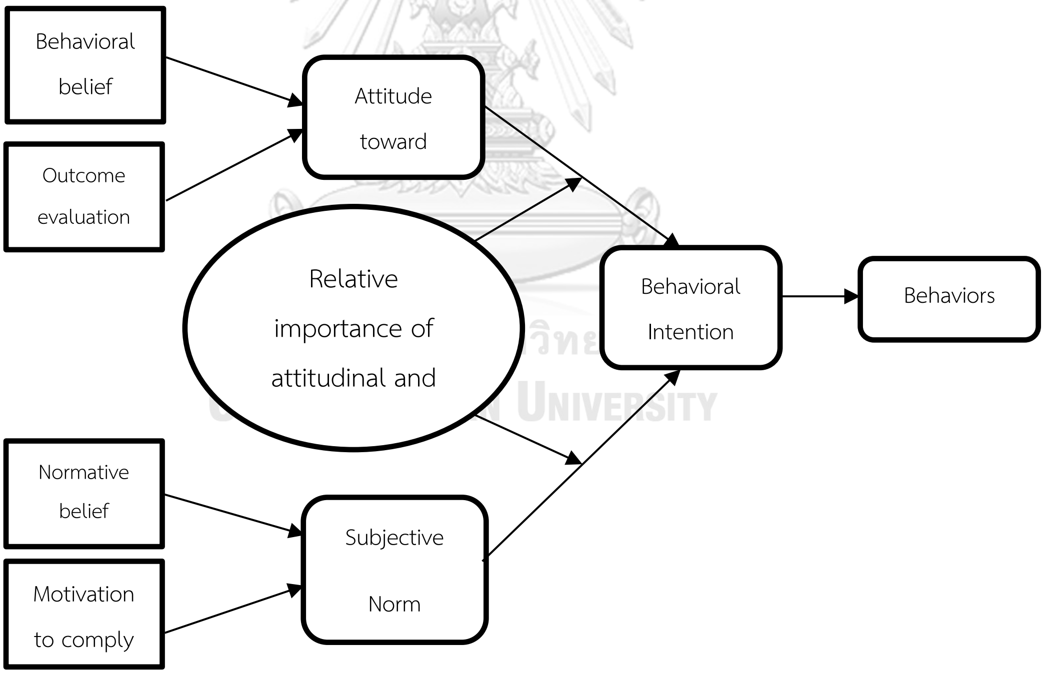


Figure 3.2 Theory of reasoned action (A. Fishbein & Ajzen, 1975)

Theory of planned behavior (TPB) as shown in Figure 3.2 was the modification of TRA by addition of perceived behavioral control to influence on the intention (Icek Ajzen, 1985). Consideration of **perceived behavioral control** (PBC) was perception of ease or difficulty to perform the behavior, also depended on control belief. Control belief is defined as the perception of resources and opportunities that can facilitate or barrier the behavior. Considering to outdoor running activity, the beautiful weather and the comfortable running shoe were the control variables to behave the action. In addition, according to the TPB theory, PBC directly determined the behavior at the same time when assume that the behavior not under volitional control and perceived control of behavior was precise (Madden, Ellen, & Ajzen, 1992)

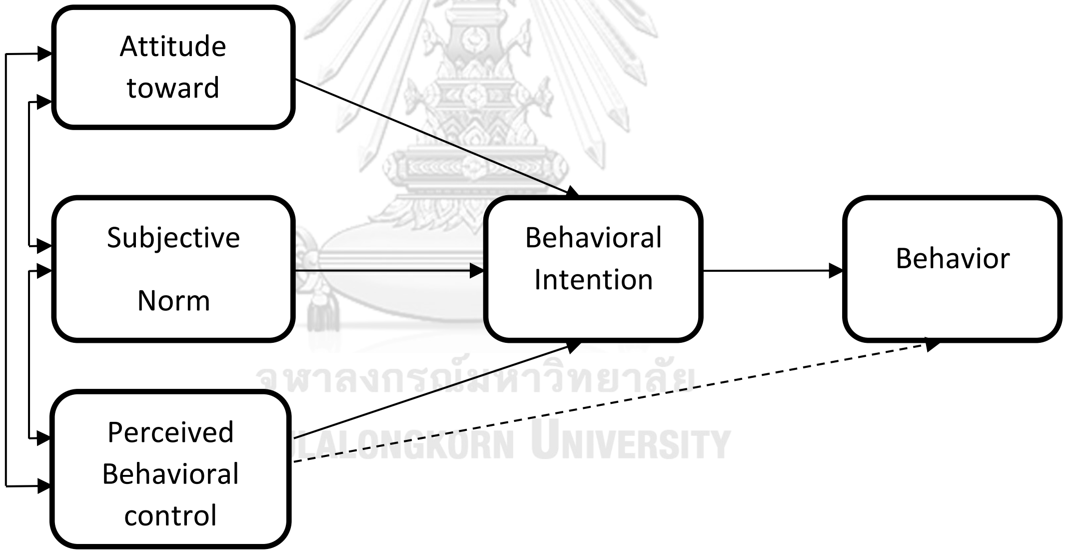


Figure 3.3 Theory of planned behavior (Icek Ajzen, 1985)

According to (Kaiser, Hübner, & Bogner, 2005) the authors compared theory of planned behavior (TPB) and the Value-Belief-Norm model (VBN) regarding to explanation of environmental conservation behaviors. The finding demonstrated that the original TPB variables was accounted for 76% of the variance of behavioral intention and 95% of the variance of conservation behavior, while personal norm, based on VBN model, explained only 64% of variance of the behavior. Additionally, the experts suggested that TPB model had more inclusive concepts at variance explanation. Moreover, TPB constructs were found to explain between 46% and 61% of the variance in employee intentions to engage in three environmental behaviors (Greaves, Zibarras, & Stride, 2013) Also, Klöckner (2013) tested a comprehensive model of environmental behaviors through a meta-analytical structural equation model based on 56 data set. This study included the most conventionally used theories regarding pro-environmental behaviors: theory of planned behavior (TPB), Norm-Activation-Theory (NAT), and Value-Belief-Norm Theory (VBN). The author confirmed that intention was a directly strongest determinant of the behavior.

TPB model is seeming to be the strong model to account for pro-environmental behaviors owing to widespread consideration of factors, such as non- environmental motivations and perceived behavioral control. (Bamberg and Schmidt, 2003) Furthermore, to encourage pro-environmental behavior change, contextual factors which may facilitate or impede the behaviors need to be consider. In other words, not only intra-personal factors such as attitude, norms, beliefs and affects but also situational factors, for instance, public facilities, basic infrastructure, supply markets and practical guidelines may strongly motivate the ecological behaviors. In terms of the theory of planned behavior, it only concerns the contextual factor as claimed as perceived behavioral control which refer to the people's perception of how to easily perform the behaviors. (Steg & Vlek, 2009)

Besides, The TPB has been widely accepted because the author suggested to include additional variables if they significantly demonstrate a proportional variance of an intention and a behavior. (Icek Ajzen, 1991) As the reasoned arguments, Theory of planned behaviors seems to be a clear proposed model to explain behaviors which significantly influenced by four components: intention, attitude, social norm, and perceived behavioral control. This theory may cover all factors that affect to human behaviors. Therefore, the theory is likely suitable to be the leading theory for a hypothetical framework in order to examine the targeted behaviors.

Application of TPB to the general behaviors

The TPB has widely applied as a conceptual framework to predict and understand varied behaviors. According to health-related behaviors, Stefanie A Fila (2006) revealed that healthy eating behavior of urban native American youth was determined by attitude, perceived behavioral control, and subjective norm, respectively, whereas the behavioral intention was only drove by attitude and subjective norm. Nevertheless, there was no relationship between the intention and the behavior of this eating pattern. It can be implied that some factors might have more effect that the intention to the behavior. MOK and Lee (2013) found that subjective norm and perceived behavior control played a significant role in prediction of behavioral intention of physical activity of the teenagers, according to TPB. Also, the finding confirmed that TBP was the practical concept to predict the behavior. Huchting, Lac, and LaBrie (2008) found that with female student clubs at a private university in Southern California, the intention of alcohol drinking was strongly predicted by social norm, while perceived behavioral control was no effect on the intention but direct effect on the drinking behavior.

Turning to consider about transportation behavior, Heath and Gifford (2002) used expansion of TPB with university students' public transportation use in western Canada and found that the original TPB model well-explained the use of public transportation system. Weerapong Chompoonut (2011) shown that social norm was the most impacting factor to the intention to change to use public transport instead of private car in Bangkok, comparing with attitude to behavior and perceived behavioral control. In another study, it found that perceived behavioral control, subjection norm, and attitude toward behavior had a direct influence on the intention of public van use in Bangkok suburban area, respectively (Jesada Paritapho (2007)).

Although TPB is practical and applicable model to understand influencing factors of the intention and behaviors, the factors differently impact on a specific behavior. As mention above, not only the useful application of TPB relate to health and transportation behaviors, but also pro-environmental behaviors (PEB).

Application of TPB to the environmental-friendly behaviors

Most of global environmental challenges are as a result of humans ‘action, so changing humans’ lifestyle is expected to address these challenges (Oskamp, 2000). Pro-environmental behaviors (PEB) involved in the contribution of environmental conservation are suggested that can tackle with the serious problems and enhance positive consequence from the PEB (Kurisu, 2015) Generally, PEB has been named in some other terms: environmental behavior, ecological behavior, environmental-friendly behavior, environmental-related behavior, etc.. In Japan, the government proposed a PEB campaign and targeted to reduce 25% of greenhouse gas from 2010 to 2012. The PEBs were categorized in 6 group: ecological life, selection of energy-saving produces, selection of renewable energy, green building and home, support of CO_2 reduction projects, and participation in local ecological activities. Additionally, to greatly encourage PEB in the society, psychosocial factors are necessary to provide insight into the PEB’s motivation (Fielding, McDonald, & Louis, 2008).

Many experts have demonstrated studies of the factors related to environmental behaviors according to TPB model. Leeuw, Valois, Ajzen, and Schmidt (2015) focused on the key factors that affect the PEB of high school students in Luxembourg. The findings shown that perceived behavioral control was the strong influential factor to intention of PEB. They suggested that to promote PEB, facilitating resource such as knowledge or money was needed. The second influential factor were subjective norm and descriptive norm that was well-exemplified to conduct PEB by family members, friend, and celebrities. Bortoleto et al. (2012) investigated waste prevention behavior in household relative to theory of planned behavior and other models. The results explained through structural equation modelling (SEM) and shown that perceive behavioral control associated with TPB and personal norm according to Schwartz (1973) were the main factors of waste reduction activity, while attitude toward behavior was a poor influence. Furthermore, subjective norm represented indirectly effect on the waste prevention behavior.

Blok, Wesselink, Studynka, and Kemp (2014) explored potential variables of PEB in department of Wageningen UR, Dutch university and revealed that perceive behavioral control and attitude toward PEB strongly determined the intention to perform PEB in the workplace, based on TPB model, whereas other factor, environmental awareness also significantly affected the intention of PEB. Klöckner (2013) presented a comprehensive model of the predictors of pro-environmental behaviors related to environmentally psychology theories using meta-analysis of structural equation modelling. Based on 56 data set of variously environmental behaviors that were from different countries, the results proved that the direct predictor of the given behavior were intention, perceive behavior control, and habits and intention was determined by attitude, personal and social norms, and perceived behavioral control, corresponding with TPB model. These studies confirmed the utility of TPB as an appropriate model to explain and predict PEB. Beside the application of TPB to general PEB, in the next part will review the utilization of TPB with the focusing behavior in this research: water conservation behavior.

Application of extended TPB (including other variables)

Numerous experts have presented various models in order to understand water conservation behaviors and intention, other variables such as socio-demographic and psychological factors might be added to the original TPB model. According to Lam (2006), the author aimed to indicate the psychosocial determinants of installation water-saving toilets intention in Taipai and Kaohsiung, Taiwan and used the TPB and other variables: vulnerability, collective efficacy, subjective effectiveness of alternative solution, personal efficacy and sociodemographic variables to predict intention to install a dual-flash controller in household. Subjective effectiveness of alternative solution was significant to explain the intention. Also, the resulted model shows that only 13% of the variance was explained by the conventional TPB, whereas 37% of the variance was account by the modified TPB model. It was suggested that expansion TPB provided further insight of the intention of water saving devices.

Perren and Yang (2015) also constructed the modified TPB model to explain water saving engagement around the house in Greece. Beside the TPB, they added information impact, age, gender, education, and habitual behaviors to the model. The information related to water conservation was claimed that it could involve belief that support attitude, subjective norm, perceived behavioral control. The result demonstrated that subjective norm, perceived behavioral control, water conservation habits, and active information searching were significant predictors of the intention to engage in water conservation, while others were not.

Kang, Grable, Hustvedt, and Ahn (2017) proposed the conceptual model incorporated into the modification of TPB including moral obligation, utilitarian belief, ecological belief, perceived drought severity, water resource concern to predict self-reported of water consumption behaviors and intention of water efficient installation of Hispanics from Texas and California. The water conservation behaviors and water efficient devices adoption intention were directly predicted by water resource concern variable. Interestingly, the resulted model proved that utilitarian belief, ecological belief, perceived drought severity, water resource concern indirectly affected the behaviors and the intention mediated by the TPB constructs (attitude, subjective norm, and perceived behavioral control). There was a connection of beliefs and original TPB variables that presented better understanding of sustainable water consumption behaviors.

In addition, Trumbo and O'Keefe (2005) studied water conservation behaviors and intention of the communities in Reno and Sparks, Nevada by the additional theory of reasoned action (TRA) model. The authors applied TRA model with environmental values and information effect to understand the intention and behaviors. They argue that these behaviors were simple patterns so perceived behaviors control was no necessary in this case. To measure the environmental values, a shortened version of new environmental paradigm (NEP) (Dunlap, Van Liere, Mertig, & Jones, 2000) was used, while to examine the effect of information, three elements of information seeking, exposure, and attention were included. The results indicated that attitude and social norm influenced the intention according to the original model and information was direct influence the behavior with intermediary between the intention and the behavior. They also suggest that to encourage pro-environmental behaviors, communication of related information may be considered.

Clark and Finley (2007) examined the influencing factors of behavioral intention to save water in Blagoevgrad, Bulgaria employing the TPB model (attitude, social norm, and perceived behavioral control) and additional variables: sociodemographic, environmental attitude, information possession, and concern of water shortage. The TPB variables were significant predictor of the intention and the original model only accounted for 10% of the variation. In case of information possession, climate change and global warming knowledge were strong to predict the intention and concerning of water shortage was also significant to predict the intention. The authors suggest that contributing resource and opportunity: knowledge and guideline about water saving behavior to public is required in order to increase perceived behavioral control.

3.5 Influence of sociodemographic factors on water conservation behaviors

In recent year, researchers have examined how socio-demographic factors determine the intention perform water conservation behaviors and self-reported of water conservation behaviors. Some studies were interest in self-reported past behaviors related to water conservation in household. Regarding the socio-demographic factors, these variables explained only 9% of past water conservation behaviors, according to F-test result. People who were higher age and higher income were more engage with water conservation behaviors, whereas other factors including place of resident, education level were no significant relationship to the target behaviors (Wolters, 2014). Additionally, Gilg and Barr (2006) identified the characteristic of people who conserve water by differentiate in four clusters: committed environmentalists, mainstream environmentalists, occasional environmentalists, non-environmentalists. The water savers who reported almost 50% participate in water saving activities were in the group of committed environmentalists that were high age, higher income, smaller household size, own their house, and higher education.

In case of measuring actual water consumption in household, Fielding, Russell, Spinks, and Mankad (2012) suggested that a small household members with low incomes and younger was predicted to conserve more water, while level of education was an insignificant determinant. Consistent with Willis et al. (2013), the results confirmed that water users with low income conserved more water. Interestingly, the result showed that larger household members, lower water consumption per capita.

To evaluate determinants of intention of water conservation behaviors, Clark and Finley (2007) found that higher age, lower education, living in a house, and no space for garden were significant related to the intention. On the other hand, gender, household income, and size of family showed no significant to the water conservation intention (Lam, 2006) did two studies of prediction the intention to install water efficient devices in Taiwan across time, and found different findings. The study 1 in 2004, the intention to install water efficient devices in household was effect by higher income, but no significant effect of gender, education level, and type of dwelling. In a contrary, the study 2 in 2006 showed dissimilar results that the intention to install water efficient devices in household was effect of type of dwelling, education level, but no effect of income level. The author suggested that it was no uniform of the influence of socio-demographic variables across studies.

Nevertheless, only sociodemographic characteristics are insufficient to predict intention of environmental behaviors. Modification of conceptual model is therefore concerned including other affecting variables such as habit, belief, ecological attitude to gain valuable insight into the water consumer. (Wolters, 2014)

3.6 Structural Equation Model

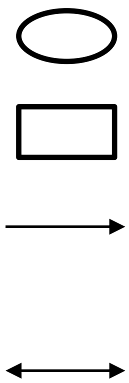
Structural Equation Model (SEM) is an all-inclusive statistical approach for testing hypothetical model and explaining relationship among variables. In other words, this method includes multiple regression analysis and factor analysis in order to assess the relationship of multiple variables simultaneously. To perform SEM, a few software programs is available including LISREL, AMOS, EQS, Mplus, and SEPATH. The SEM consists of two principal models: measurement model and structural model. To begin with, measurement model is the model that confirm a correlation between observed variables which are directly measured and indicated and latent variables which are not directly measure but can implied by the relationship to the observed variables. This measurement model can specify the relationships through confirmatory factor model (CFA). For another, structural model is the model to identify the relation between the latent variables which infer from the observed variables. Therefore, this structural model applies the concept of regression analysis to examine the correlation among the variables. In addition, the SEM involves in many particular jargons as described below and the example SEM diagram is also demonstrated as in Figure 3.4 and 3.5.

(1) Exogenous Variables- are independent variables that determined by other constructs outside the model.

(2) Endogenous Variables- are dependent variable that influenced by other constructs in the model.

(3) Latent Variables- cannot be directly measured but can be measured by the observed variables.

(4) Observed Variables- are called as measured variables that link with the latent variables. In other words, there variables refer to the indicators of the latent variables and the items or questions as in the questionnaire.



The circles represent observed Variables

The rectangles represent latent Variables

The single-headed arrows represent the effect of one variable on another

The double-headed arrows represent covariances or correlations between pairs of variables

Figure 3.4 Symbols in the Structural Equation Model (Adapt from Byrne (2010))

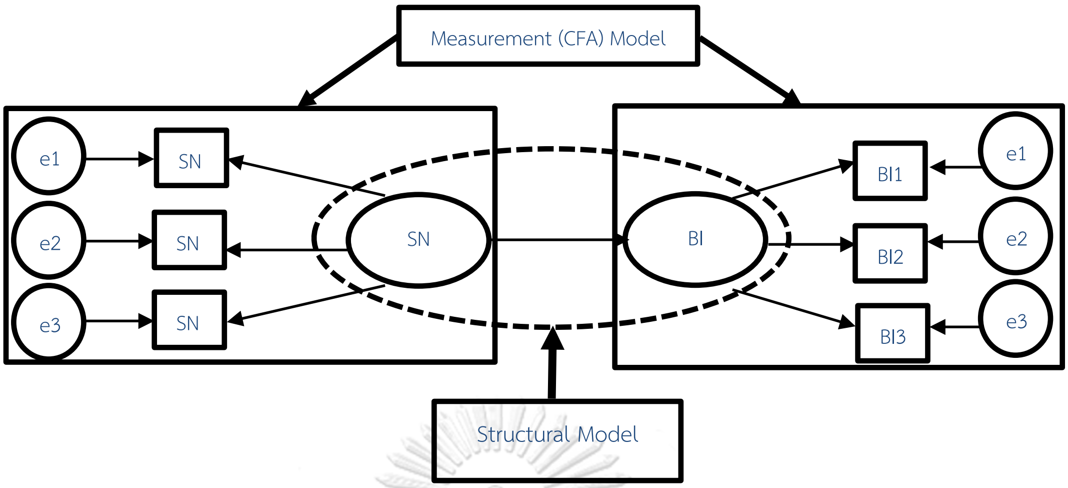


Figure 3.5 Components of the Structural Equation Model (Adapt from Byrne (2010))

Application of SEM for environmental-friendly Behaviors and other behaviors

SEM is widely applied in psychology and social science in order to study the relationships of multiple variables (Fu, Wu, & Gao, 2015). Some researchers have used this method to explain environmental-friendly Behaviors and other behaviors. According to Kilic and Dervisoglu (2013), these authors developed a Structural Equation Model (SEM) using AMOS18 to examine water saving behavior of 497 secondary school students in Erzincan, Istanbul, and Sanliurfa in Turkey. And, the framework of the theory of planned (TPB) behaviors was applied and the result showed that 62% of TPB model could explain the behavioral intention.

Moreover, Han and Hyun (2018) studied guests' water conservation and towel reuse behavioral intention which related to pro-environmental behaviors in United States and conducted SEM to analyze the propose model and test the relationships among the constructs.

In addition, Bortoleto et al. (2012) proposed model development for waste prevention behavior in household in Sao Paulo, Brazil by applying SEM method in

AMOS software. To evaluate the model, the theory of planned behavior and Schwartz's altruistic behavior model were included in the proposed model and the result indicated that personal norms and perceived behavioral control are the essential influences on the water prevention behavior.

In term of other behavior, Weerapong Chomponut (2011) explored the influential factors that affected to willingness to use public transport in Bangkok. The data were analyzed by Confirmatory Factor analysis (CFA) and Structural Equation Model (SEM) methods to explain the intention to change from private vehicle to public transport. These studies confirmed the usefulness of the SEM method to estimate multiple and interrelated dependence relationships, indicate relationship of observed and unobserved variables which account for measurement error in the estimation process, and define all entire a set of model relationships. These distinguished benefits of SEM are suitable characteristics method for studying the behavior and the affecting factors.

CHAPTER 4
METHODOLOGY

This research aims to study people’s behavior and the behavioral factors on water uses and water conservation. Questionnaire survey is designed as experimental approach to collect data for water use behavioral analysis. Ultimately, the data will be used to prove the structural model and hypotheses. This chapter demonstrates research procedures to achieve the objectives of this thesis. The methodology is divided into 5 steps including (1) literature review, (2) development of questionnaire survey, (3) data collection, (4) results analysis, and (5) discussion and conclusion, as shown in Table 4.1. The detail description for each step are explained as following.

Table 4.1 Outline for research methodology

No.	Process	Task	Activity
1	Literature review	Review water use pattern in household	Review the related documents
		Review influential factor for water conservation behaviors	
		Review related studies of water use and water conservation behaviors	
		Identify research framework	
		Select statistical methods	
2	Development of questionnaire survey	Targeting the behaviors	Review the documents
		Set the influential factors according to the research framework	

No.	Process	Task	Activity
		Collecting statements related to the variables from previous studies Set scale to measure the variables	
		Pre-testing the questionnaire survey	Carry out the pre-survey
		Editing the questionnaire survey	Revise the questionnaire
3	Data collection	Selecting study area and sample size	Choose the study area and calculate the size
		Conducting the survey	Carry out the main survey
4	Data analysis	Descriptive statistic	Analyze the data by SPSS and AMOS
		Structural Equation Model (SEM)	
5	Conclusion and Recommendation	Discussion and Conclusion of the research output	Discuss and conclude
		Recommendation for water conservation policy	Generate the potential recommendation

4.1 Literature review

According to the first purpose of this research "To better understanding of water use pattern in household, Bangkok, Thailand", the first step is to conduct relevant literature review. The related data and documents were searched in order to acquire domestic water use pattern including micro-components in the house: toilet, sink, shower washing machine, average water consumption per capita per day and a list of water saving behavior. Moreover, the group of water saving equipment that were used in household, such as low-flow shower head/ faucet, water saving toilet/ washing machine, and the standards of products' proofing: Thai Industrial Standards Institute and Green labelling were also examined. Eventually, everyday water conservation behaviors and one-time behavior of water saving products' installation were specified to be the target behaviors. This information will be the foundation to identify a research framework and to develop the questionnaire survey.

After studying about the target behaviors, socio-demographic and psychosocial factors were overall reviewed. On the one hand, the socio-demographic variables were consisted of age, gender, level of income, level of education, and household size which each variable has both positive and negative effect depending on different context of study areas. On the other hand, the psychosocial factors engaging in the theory of planed behavior contained attitude toward behavior, social norm, and perceived behavioral control. In addition, factors of Information effects were included. At last, to identify the most affecting determinant of water conservation behaviors to accomplish the second objective of this thesis, structural equation model (SEM) which was suitable for analysis the hypothesis model needed to be considered. This statistical method would explain the relationship among observed and latent variables. To clear understand, the description of a model framework will be revealed as below.

Research Framework and Hypotheses

The purposes of this thesis are to identify the influential factors to intention and behavior of water conservation. **Structural Equation Modelling (SEM)** which is the statistical technique based on theory of planned behavior is used to set up framework for analyzing correlation of multiple variables affecting water use behavior. To construct the measurement model, latent variables and observed variables are identified. Latent variables cannot directly measure from data collection but can generate from theoretical concept, on the other hand observed variables are directly measured in a questionnaire survey which indicate the latent variables.

Based on theory of planned behavior (Icek Ajzen, 1985), affecting factors to the behavioral intention and target behavior are attitude toward behavior, subjective norm, and perceived behavioral control. Moreover, socio-demographic and information effects variables are added to the model to examine correlation to the target behaviors. For repeatable behaviors refers to everyday behavior in household, so frequent of behaviors' performing can be directly measure from the self-reported questionnaire. One-time behaviors relating to in frequent activity in household, in this study include installation of water efficient appliances, dual-flush toilet, low-flow faucets, and water saving washing machine. The study will examine whether or not people have the intention to use these appliances. As the two target behaviors related to water conservation behaviors in household, every day and one-time water conservation behaviors, the model I and II framework are demonstrated in Figure 4.1, respectively. The particular factors reviews are described below.

Attitude toward repeatable water conservation behavior has direct influence on the intention and behaviors Gilg and Barr (2006) demonstrated noticeable evidence that individuals who perceive about environmental issue inclined to save environmental resources. These environmentalist group believed that there are limited of resources, so they should be preserve. Willis, Stewart, Panuwatwanich, Williams, and Hollingsworth (2011) revealed people who are very positive environmental attitude used less water in households. This study assessed average daily water consumption in different household activities by smart metering approach.

Subjective norm has direct effect on the intention and behavior. According to a meta-analysis (Morren & Grinstein, 2016), the authors suggests that there is stronger relationship of subjective norm and intention to perform environmental activities in developing countries than developed countries. Perren and Yang (2015) revealed that there is positive association between subjective norm and intention to save water.

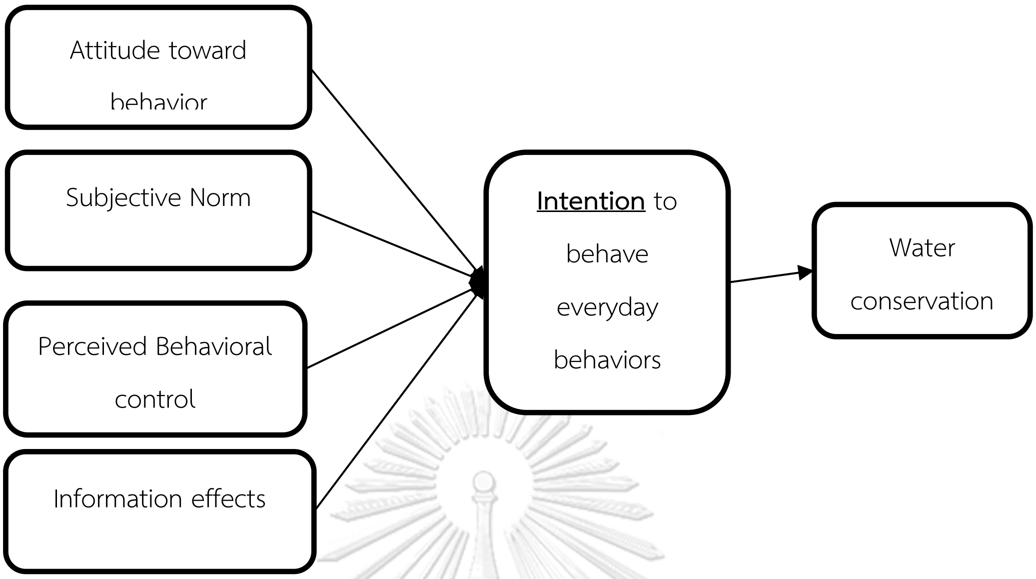
Perceived behavioral control (PBC) has direct influence on the intention and behaviors. PBC is defined as resources and opportunities available to individual to achieve the target behaviors. Icek Ajzen (1991) claimed that “PBC plays an important part in the theory of planed behavior”. Clark and Finley (2007) studied water consumer in Bulgaria and the results showed the positive of PBC on water conservation intention.

Socio-demographic have an influence on the intention and behaviors. The role of this factor still be doubtful relating environmental behaviors and depend on the context of population. Simmalee, Akamphon, Jindorojana, and Thatthong (2008) studied the influencing factors of water conservation attitude in Khon Kaen, Thailand and found that family status, education background, family income and frequency of getting water conservation information were affecting over water conservation attitude. Wolters (2014) studied household water consumption behavior in Oregon, USA and concluded the reliable individual factors for prediction of water conservation: age, gender (women), income.

Information effects relating to elements of information seeking, exposure, and attention have influential some effects on the two intentions of repeatable and one-time behaviors which are relevant to water conservation. Trumbo and O'Keefe (2005) expanded the Theory of reasoned action (TRA) model with these information effects in order to water conservation behaviors and intention of the communities in Reno and Sparks, Nevada and found that the information exactly determined water conservation behaviors. Moreover, Perren and Yang (2015) confirmed that active in searching information related to water saving also had significant to predict intention of water use behaviors.

Although there are many affecting factors that determine water conservation behaviors, based on the researcher's viewpoint, subjective norm will be the most powerful factor that influence intention on water conservation behaviors in household. This factor reflects the perception of social support to the intention to perform the behaviors. If people realize that their family and friend as well as celebrity concern about water saving behaviors, they will be aware of social support for engaging water conservation behaviors.

a.



b.

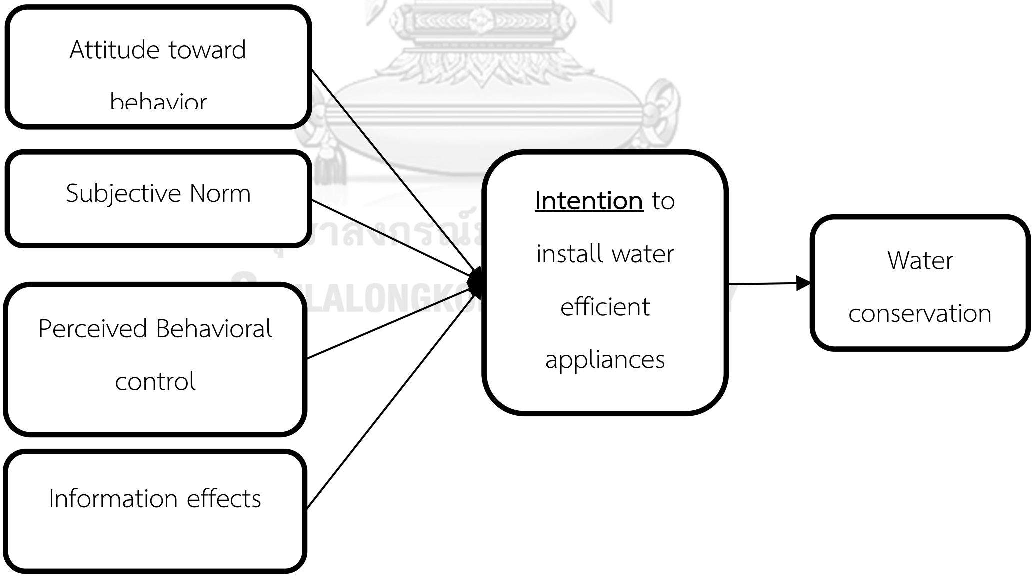


Figure 4.1 (a) The framework model I: everyday water conservation behaviors (b) The framework model II: one-time water conservation behaviors

4.2 Development of questionnaire survey

Questionnaire surveys are practical approaches for data collection to understand people's attitudes and behaviors which are environment-friendly (Kurisu, 2015). There are some guideline steps to generate the questionnaire proposed by Kurisu (2015) as shown in Figure 4.2.

Firstly, the targeted behaviors needed to be identified which depend on my interest. This study focuses in everyday and one-time water conservation behaviors. The research will set up what the key hypothesis for the target behavior/ phenomenon is. The hypothesis factors to the targeted behaviors and related theories should be concerned and this research is associated to **Theory of planned behavior (TPB)** which claimed that behavior directly influenced by intention (Icek Ajzen, 1991). For third step, the influential factors of that hypothesis should be considered. Therefore, the behavioral intention was determined by three factors; attitude toward behavior, subjective norm, and perceived behavioral control according to TPB. Furthermore, according to the previous review, Information effects might be affecting factors to these behaviors which were included in this survey. Finally, the last step would be concentrated on sociodemographic factor such as age, gender, education level, household size, and income. This factor can have both direct and indirect influence on environmental behaviors (Kurisu, 2015). Following these procedures, the main concept of the questionnaire would be formed.

The psychosocial factors, attitude toward behavior, subjective norm, perceived behavioral, and information effects cannot directly measure, so- called **latent variables**. The **observed variables** are referred to the question items that were created to assess them. Each statement (item) that determines each psychosocial factor can be collected from previous studies as shown in **Table 4.4.**

In general, to evaluate the degree of agreement or not agreement, Likert scale is the most popular technique applying to the statements. This scale consists of odd-number score which the middle score is usually neutral. However, the six-score scale: three scales for negative side and three scales for positive side would be applied in this survey in order to separate people's opinion into two group: agreement and disagreement. And the detail of questionnaire survey will follow as below.

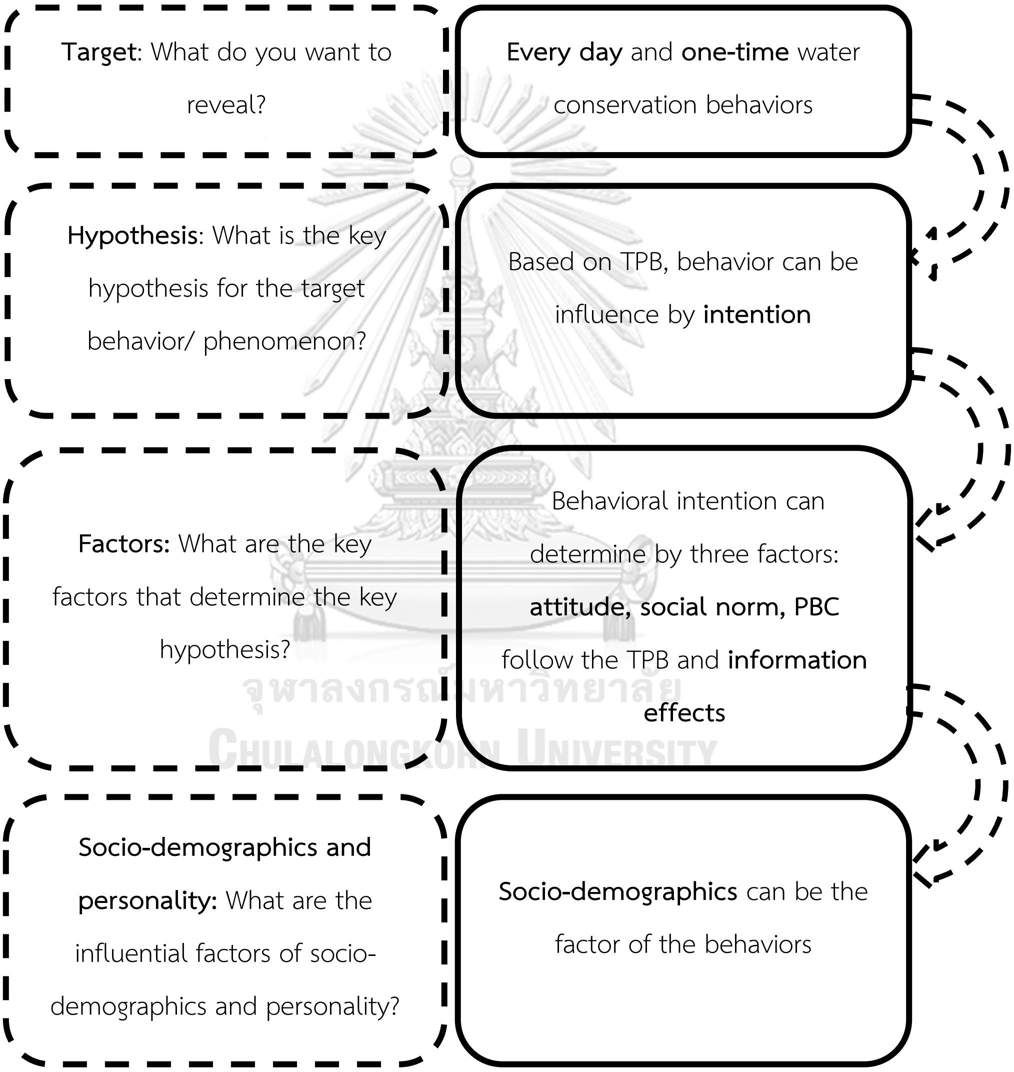


Figure 4.2 The recommended procedure for preparing a questionnaire (Adapt from Pro-environmental Behaviors by Kurisu (2015))

<u>**Questionnaire survey**</u>

To measure latent variables (attitude, subjective norm, perceived behavioral control, information effects), questionnaire survey is required to assess respondents' understanding about relationship of affecting factors and the intention and behaviors. This study, the survey consists of 3 sections: 1. Socio-demographic information 2. Actual water conservation behaviors in household 3. Respondents' opinion about water conservation. All of sections are explained as below.

Section 1: Socio-demographic. Gender, age, education background, income, occupation, ownership status, and family size are asked to assess association with the intention and the behaviors to conserve water in their household.

Section 2: Actual water conservation behaviors in household. The seven questions are asked to respondents to make self-assessment about water conservation in household as follow:

1. How long do you stay at the condominium per week?
2. Do you cook in the condominium? and How many times per week?
3. Do you wash your clothes by yourself?
4. From Question no.3, If you wash your clothes by yourself, which method do you use? Hand washing or Washing machine.
5. How much do you pay per month for water supply?
6. How often the respondents perform these daily water conservation behaviors? (as shown in Table 4.2) The behaviors are measured by six scales frequency (always, often, sometime, occasionally, seldom, never)
7. Do you install these water-saving appliances in your household? The lists of the appliances are shown in Table 4.3

Table 4.2 Daily water conservation behaviors

No.	Daily water conservation behaviors	Source
1	I clean food scraps before dish washing.	Adapt from Fielding at el. (2012)
2	I turn off tap during cleaning dishes.	Gilg and Barr (2006)
3	I turn off tap during soaping.	Gilg and Barr (2006); Wolters (2014)
4	I turn off tap during brushing teeth.	Gilg and Barr (2006); Wolters (2014)
5	I make sure that taps do not drip.	Lee et al., 2013 as cited in Kurisu (2015)
6	I wash full loads of laundry.	Fielding at el., 2012; Wolters (2014)
7	I check water equipment and make sure that no leakage.	Wolters (2014)
8	I change water equipment immediately after I find it is broken.	Adapt from Kurisu (2015)

Table 4.3 Water-saving appliances

No.	Water-saving appliances	Source
1	Dual-flush water closet	Fielding et al., 2012
2	Single-flush water closet: water saving 4.8 liter/flush	Fielding at el., 2012
3	Aerated faucet	Wolters (2014)
4	Automatic faucet	Based on product in Thailand, (Thailand Industrial Standard, 2009)
5	Aerated shower	Fielding at el., 2012
6	Pressure control shower	Based on product in Thailand,(Thailand Industrial Standard, 2009)

No.	Water-saving appliances	Source
7	Water saving urinal	Based on product in Thailand, (Thailand Industrial Standard, 2009)
8	Water saving washing machine	Fielding et al., 2012

Section 3: Respondents' opinion about water conservation. The psychosocial factors (AT, SN, PBC, IE) and the intention (IN) will be measured. The respondents are questioned "How much do you agree with these following statements?" by six-points scale (strongly disagree to strongly agree). The seven-point scale is divided into three agreed point, neutral, and three disagreed point. The questionnaire items are demonstrated in Table 4.4.

Table 4.4 Variables from TPB model and the questionnaire items.

Latent variables	Symbol	Observed variables	Source
Attitude toward behavior	AT1	I believe that water conservation is important and necessary.	Clark and Finley (2007)
	AT2	I believe that water conservation is my responsibility.	Own wording
	AT3	I believe that water conservation can release water shortage effect.	Own wording
	AT4	I believe that water saving appliances can actually save water.	Own wording
	AT5	I believe that water saving appliances are necessary for every household	Own wording

Latent variables	Symbol	Observed variables	Source
	AT6	I believe that installation of water saving appliances can release water shortage effect.	Own wording
Subjective norm	SN1	People I know think water conservation is important.	Clark and Finley (2007)
	SN2	I feel others would be proud of me if I make an effort to conserve water.	Kang et al (2017)
	SN3	My friends and family want me to conserve water.	Own wording
	SN4	People I know think that installing water saving appliances is good to environment.	Own wording
	SN5	My friends and family agree with me to install water saving appliances.	Own wording
	SN6	My friends and family want me to install water saving appliances.	Own wording
Perceived behavioral control	PBC1	At home, saving water is hard to me.	Kang et al (2017)
	PBC2	I think that water saving is consuming my time.	Own wording
	PBC3	I can control my water consumption in my condominium.	Own wording
	PBC4	It is easy to find and buy water saving appliances.	Lam (2006)
	PBC5	I think that installing of water saving appliances is not complicated.	Own wording

Latent variables	Symbol	Observed variables	Source
	PBC6	I can choose to install or retrofit water saving appliances in my condominium.	Own wording
Information effects	IE1	How much effort have you made this year to look for information on water conservation?	Trumbo and O'keefe (2005)
	IE2	How much information about water conservation have you seen or heard from each of following sources in the last twelve months? (The sources used were newspaper, television, internet, radio, family, friends, etc.)	Trumbo and O'keefe (2005)
	IE3	When you come across information on saving water how much attention do you give it?	Trumbo and O'keefe (2005)
Behavioral intention	IN1	I intent to conserve water in the next six months.	Fielding at el. (2012)
	IN2	I intent to install water saving appliances, if I have a chance to re-install water appliances in my house.	Own wording

4.3 Data Collection

Study Area

Sample population focuses on condominium in Bangkok area. According to www.terrbkk.com, 2014, location for condominium in Bangkok has been divided in fours zones. Firstly, center business districts involve in Sathon, Pathum Wan, Watthana, etc. Secondly, urban areas include Ratchathewi, Phaya Thai, Pom Prap Sattru Phai, Phra Nakhon, Din Daeng, Huai Khwang, Chatuchak, etc. which are high-density of outer population and connected to central of Bangkok by sky train and subway are covered. Besides, these areas are varieties of social and economic activities because famous department stores, popular tourist spots, commercial buildings, university and government office buildings are located here. Next, east outer ring road and west outer ring road areas are easily connected to the city center by express way. The east outer ring road areas cover Prawet, Suan Luang, Min Buri, Lak Si, Bueng Kum, Bang Khen, etc. And the west outer ring road areas cover Bang Khae, Taling Chan, Thawi Watthana, etc. In this study, the urban areas including Ratchathewi, Phaya Thai, Bang Sue, Chatuchak, Din Daeng, Huai Khwang are mainly focused.

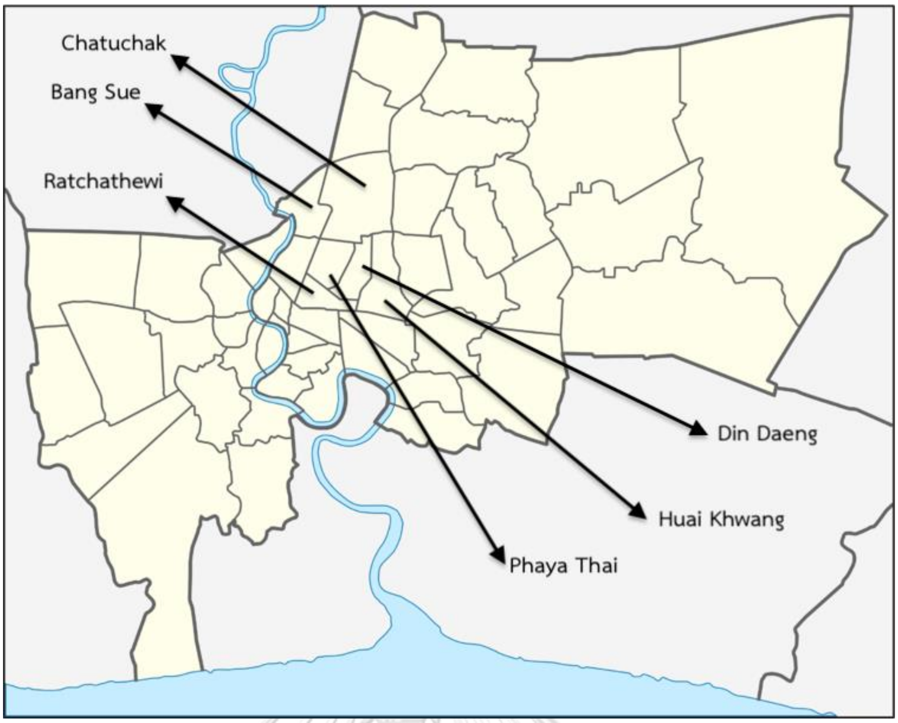


Figure 4.3 Study Area: Bangkok, Thailand

Sample size

To calculate the sample size for data collection, Yamane (1967) formula will be used. According to Bangkok registered residents in December 2016, the population was 385,100 unit, so the sample size will be 400 samples as 95 percent confidence.

Taro Yamane formula (Yamane, 1967)

$$n = N / [Nd^2+1]$$

when n = the sample size

N = the population size

d = the acceptable sampling error

95% confidence level and p = 0.5 are assumed

According to Structural Equation Model (SEM) which is the key statistical analysis in this research, F. Hair, C. Black, Babin, and E. Anderson (2014) suggested that the suitable sample size should be around 100-500 samples depending on the model complexity. For instance, Minimum sample size - 100, the model contains five or fewer constructs, each construct with more than three items and high item communalities. Therefore, the proposed models in this research contains four constructs, the minimum sample size can be 100 samples. In order to minimize the error, the number of sample size must be large as show in the Figure 4.4.

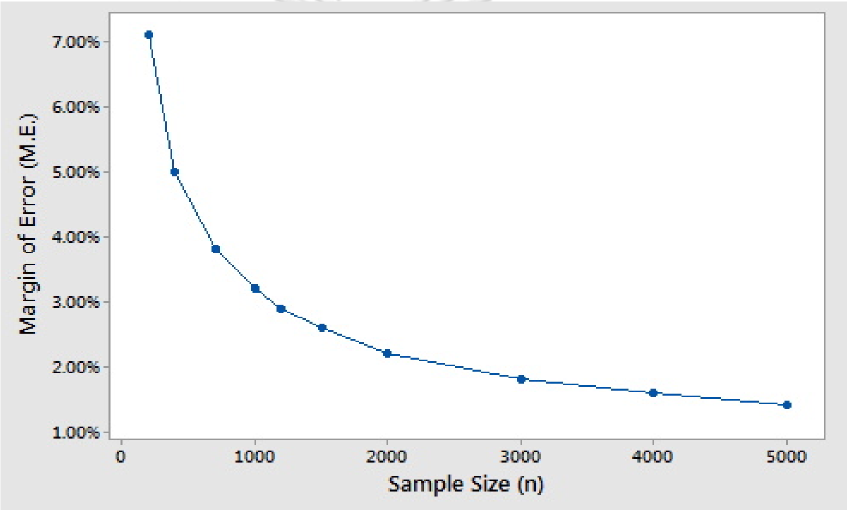


Figure 4.4 Relationship between sample size and margin of error

Source: https://onlinecourses.science.psu.edu/stat100/node/17

Questionnaire distribution

The data were collected by two methods. Firstly, face-to-face method was conducted. Because of the privacy policy of each condominium, the letter of data collection permission had been sent out to 10 condominiums covering the study areas. The process had to deal with voluntary collaboration, only four condominiums accepted the permission for face-to-face interview at the condominium. And, 50 questionnaire surveys were answered.

However, to achieve the target sample size, the data collection method adapts to online-based via google form. This method is a free online tool that allow the user to collect information easily and efficiently. The google forms was distributed to the specific respondents covering the study zone in Bangkok. And 160 questionnaire surveys were answered via google form. The result data are analyzed using two sources of data.

4.4 Data Analysis

The results can be divided in 3 sections which is descried below.

Section 1 Descriptive statistic

To explain characteristics of the sample group including sociodemographic data and behavioral data, descriptive statistic such as mean, frequency, percentage, standard deviation, and variance will be used to analyst data. The sociodemographic data: gender, age, education level, income, and household size will demonstrate general characteristics of the sample group. The self-report of behavioral data relates to both target behaviors: everyday behaviors and one-time behavior. While everyday water conservation behaviors will be revealed on the frequency of each behavior undertaken, one-time water conservation behaviors will be reported on the ownership of the water saving devices. Moreover, the Statistical Package for the Social Sciences (SPSS for Windows) will be applied to analyst the data.

Section 2 Inferential Statistics

To determine influencing factors of sociodemographic to the target behaviors, one-way Analysis of Variance: ANOVA will be used to used. ANOVA is useful in testing dependent variable, which is water conservation behaviors in this thesis. And, the Statistical Package for the Social Sciences (SPSS for Windows) will be employed.

Section 3 Structural Equation Model

To evaluate hypothesized model and explain relationship of observed variables (items in the questionnaire) and latent variables (psychosocial factors), Structural Equation Model (SEM) comprise 2 main steps: measurement model is to confirm relationship between observed and latent variables regarding to the theory model by using confirmatory factor analysis (CFA), and structural model is to determine significant influence among the latent variables through multi-regression analysis. This AMOS program is selected to use for this method.

SEM can be useful to test model theories comprising of multiple variables constructs and include mediated variables and model error term in all measured variables. To set up the Structural Equation Model (SEM), there are consisted of six steps as follow:

Step 1: Defining individual variables

Step 2: Developing the overall measurement model

Step 3: Designing a study to produce empirical results

Step 4: Assessing the measurement model validity

Step 5: Specifying the structural model

Step 6: Assessing the structural model validity

The brief introduction of these six-stage process will be described. (see Figure 4.5)

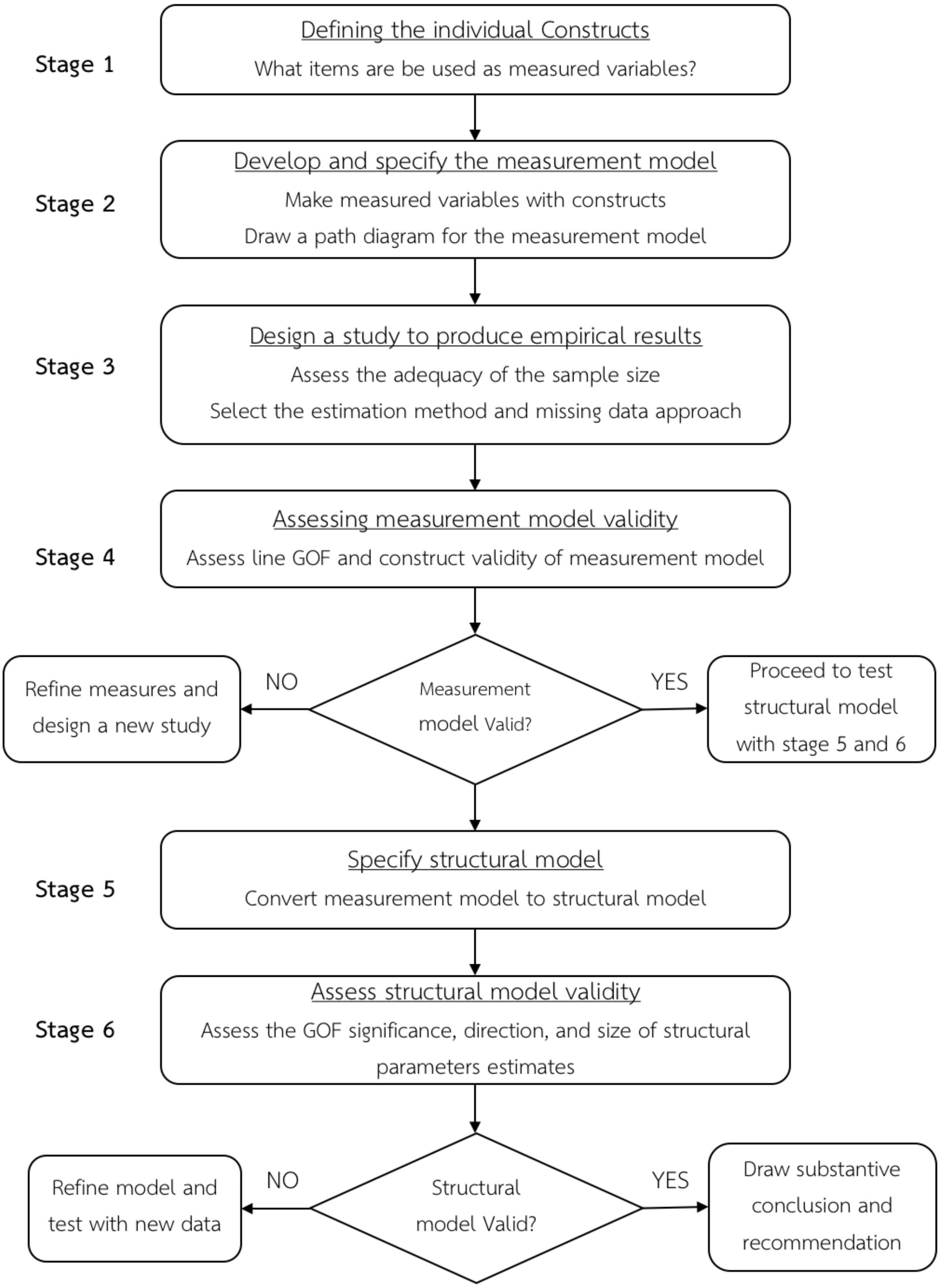


Figure 4.5 Six-stage process for Structural equation modeling

Step 1: Defining individual constructs

To achieve useful results from SEM, a good theory measurement must be provided involving designing or selecting observed items that reflect to latent variables. Mostly, the researchers invest time and effort into previous researches to identify the individual constructs (observed and latent variables). Besides, the measurement scale such as Likert scale need to be identified. After developing the theoretical constructs, pretesting should be applied to investigate items for appropriateness and refine or delete improper items before conducting main survey.

Step 2: Developing the overall measurement model

After specifying the items, the measurement model must be developed including each latent and indicated variables in the model. Also, the correlational relationship among the variables, error terms for the indicators are identified. For example, the basic measurement model can be demonstrated as in Figure 4.6.

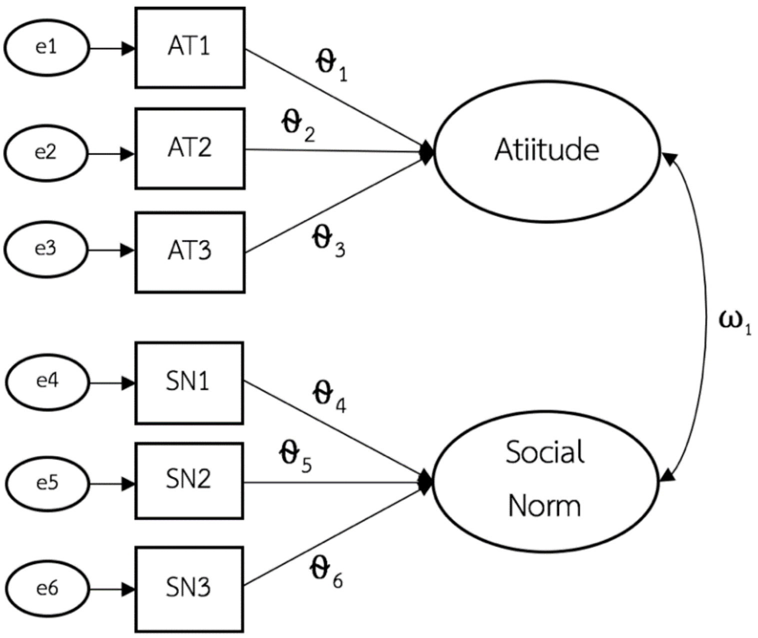


Figure 4.6 The example of measurement model

The Figure 4.6 represents general two construct measurement models with three observed variables (AT1-3 and SN1-3) for each construct (Attitude and Social Norm) and a correlation between the constructs. Moreover, the model consists of 13 estimated parameters and these 13 estimated parameters include six loading estimates ($\theta_{1\text{-}6}$), six error estimates (e1-6) and one correlation estimate (ω_1).

Step 3: Designing a study to produce empirical results

This third step is involving with research design and model estimation. In terms of research design, the impact of sample size and the type of data that have a profound consequence on a result must be considered. On the issue of model estimation, estimation techniques and the current computer software are discussed.

The issue of research design

- Sample size. There is an important key in designing the sample size that larger sample size normally produces more stables results. However, (F. Hair et al., 2014) concluded that sample size must be based on a set of fact nor.
  - Minimum sample size- 100: Model containing five or fewer constructs, each with more than three items (observed variables) and with high item communalities.
  - Minimum sample size- 150: Model containing seven or less constructs, modest communalities and no underidentified constructs.
  - Minimum sample size- 300: Model containing seven or fewer constructs, lower communalities and/or multiple underidentified constructs.

- Minimum sample size- 500: Model large number of constructs, lower communalities and/or having fewer than three measured items.

- Metric data. The indicator or observed variables must be metric data, in other words, interval or ordinal data. This type of data can be directly calculated of covariance among the items.

The issue of model estimation

- Estimation technique. The technique refers to the mathematical algorithm that use to identify estimates for each parameter. Maximum likelihood estimation (MLE) seem to be the most popular because it is flexible approach to parameter estimation to reach the best model fit, also many experts compared MLE with other techniques and found that this method gives reliable results.
- Computer programs. There are many available statistical programs including LISREL (LInear Structural RELation), EQS (Equation), and AMOS (analysis of moment structures). To select a SEM program is based on researchers' preference.

<u>Step 4: Assessing the measurement model validity</u>

To test validity of the measurement model, it consists of three steps. To begin with, examining the coefficients and the symbols in the model whether follow as the hypothetical theory, also including the R-square that should be indicate for model reliability. Next, the second step is to confirm how well specified model reproduces the observed covariance matrix among the observed items as divided in three groups: (1) estimation Absolute Fit Indices includes many statistical values as follow: Chi-Square Statistics (λ^2), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Root Mean Square Residual (RMR), and Root Mean Square Error of Approximation

(RMSEA). (2) comparing hypothetical model and null model includes statistical value as follow: Comparative Fit Index (CFI). (3) Miscellaneous Measures consists of λ^2/degree of freedom. The last step is an analysis of residual error and model modification index in order to estimate the level of fit model. The criteria of evaluating model fit is provide as Table 4.5

Table 4.5 Structural equation modelling model fitness criterion (Bortoleto et al., 2012)

Model fit criteria	**Interpretation and recommended acceptance levels**
λ^2 (chi-square)	Tests H0: R(H) against Ha: S – R(H) p > (considered significance level) 0.05
GFI	Ranges from 0 (no fit) to 1 (perfect fit) Values higher than 0.9 suggest a good fit
CFI	Ranges from 0 (no fit) to 1 (perfect fit) Values higher than 0.9 suggest a good fit
RMSEA	Values lower than 0.08 indicate adequate model fit Values lower than 0.05 indicate good model fit
AGFI	Ranges from 0 (no fit) to 1 (perfect fit) Values higher than 0.8 suggest a good fit
Normed λ^2 (chi-square)	Less than 1 is a poor model fit Higher than 2 reflects a need for improvement

Note: λ^2 (chi-square) test, GFI: goodness-of-fit index, CFI: comparative fit index, RMSEA: root-mean-square error of approximation, AGFI: adjusted goodness-of-fit index, PNFI: parsimonious normed fit index, AIC: Akaike information criterion.

<u>Step 5: Specifying the structural model</u>

This step involves in specifying the structural model by assessing the relationship of the latent variables based on the proposed model as shown in Figure 4.7.

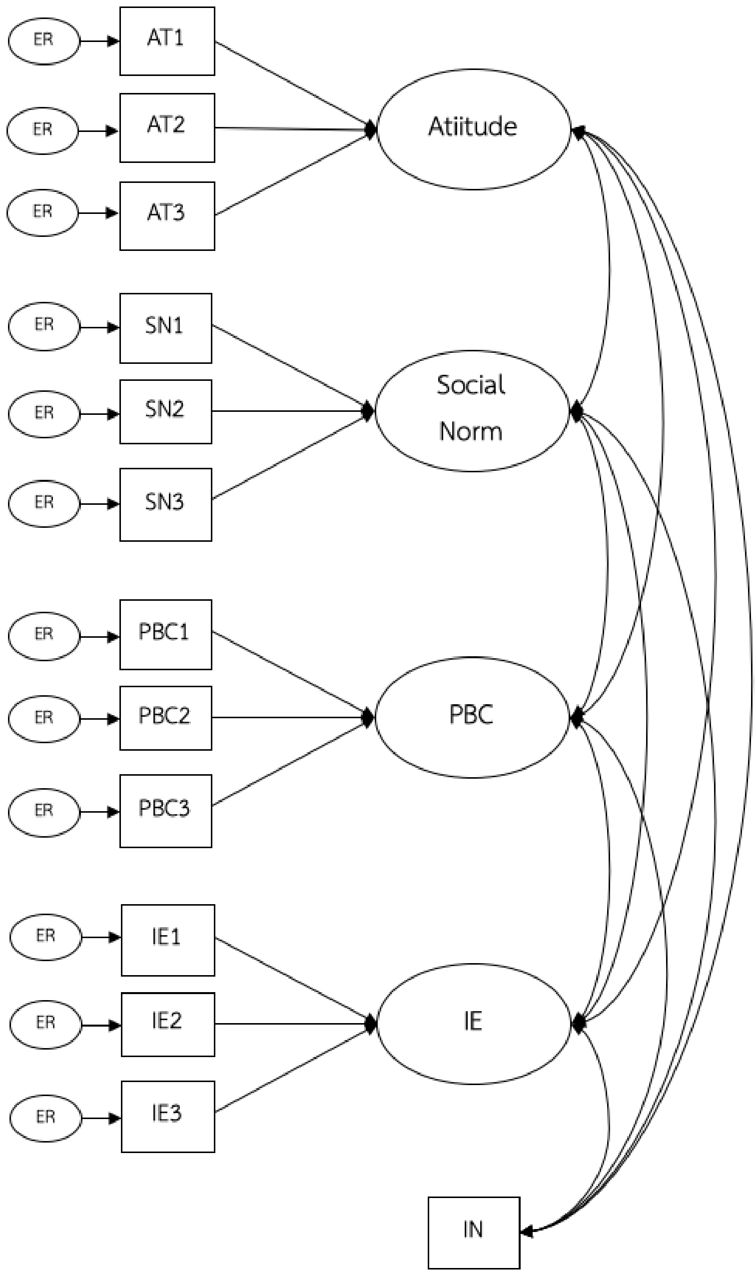


Figure 4.7 A path diagram showing hypothesized measurement model specification

<u>Step 6: Assessing the structural model validity</u>

The final step involves testing validity of the structural model and its hypothesized relationship. Also, comparing models of similar complexity, the nested model approach is common method which based on a chi-square (λ^2) difference statistic ($\Delta\lambda^2$)

CHAPTER 5

RESULTS AND DISCUSSION

According to the research methodology, after conducting the data collection by questionnaire survey, data analysis using statistical method was applied. The results analysis and discussion present in this chapter. This chapter consists of six sections as following; (1) respondent's characteristics (2) water conservation practices (3) effects of socio-demographic factors on everyday water conservation behaviors (4) factors affecting the water conservation behaviors (5) Confirmatory Factor Analysis (CFA) (6) Structural Equation Model (SEM).

5.1 Characteristics of samples

This section will provide descriptive information about the survey data (Respondents' characteristics) that were collected, such as socio-demographics, self-report behaviors of water conservation etc. The descriptive statistics are applied for analyzing these survey data.

According to the study area, the Chatuchak, Ratchathewi, Phaya Thai, Bang Sue, Din Daeng, Huai Khwang districs were mainly focused which were high-density of outer population and connected to central of Bangkok by sky train and subway are covered. The survey data was collected from 210 respondents in addition to the minimum sample size – 100 for the proposed methodology. The highest respondents were in Chatuchak district, about 62 answered surveys, and the second highest respondents were in Bangkhen, about 20 answered surveys.

Figure 5.1 demonstrates zone classification of condominium in Bangkok which is categorized by 4 zone including central business district, urban area, west outer ring road, and east outer ring road. Most of the respondents are classify as the urban area zone, 53 percent, while only 10% of the respondents are in west outer ring road area covering Nong Chok, Phra Khanong, Chom Thong, Bang Khae. Besides area classification, the condominium in Bangkok can grade in 5 levels according to price (Knight Frank Thailand's Research, 2016)

1. Super prime condominium refers to the top 1 percent of Bangkok condominium which cost more than 280,000 Baht per square meter. This condominium is located on the central business district (CBD) on the main road near mass transit.
2. Prime condominium describes the top 5 percent of Bangkok condominium which cost more than 200,000 Baht per square meter. This type also is located at the CBD, in a Soi or side-street branching off a main road.
3. Grade A condominium is most of condominium in the CBD which cost between 150,000 to 200,000 Baht per square meter. The location is at CBD and city outer and easy to access the mass transit
4. Grade B condominium is cost between 80,000 to 149,999 Baht per square meter which is located the city fringe.
5. Grade C condominium is cost lower than 80,000 Baht per square meter.

Figure 5.2 presents the questionnaire responding by price classification. Most of the respondents are in grade B condominium, approximately 53 percent, while the second highest respondents are in grade A condominium, about 34 percent. It can be implied that the respondents purchase the condominium depending on the price factor.

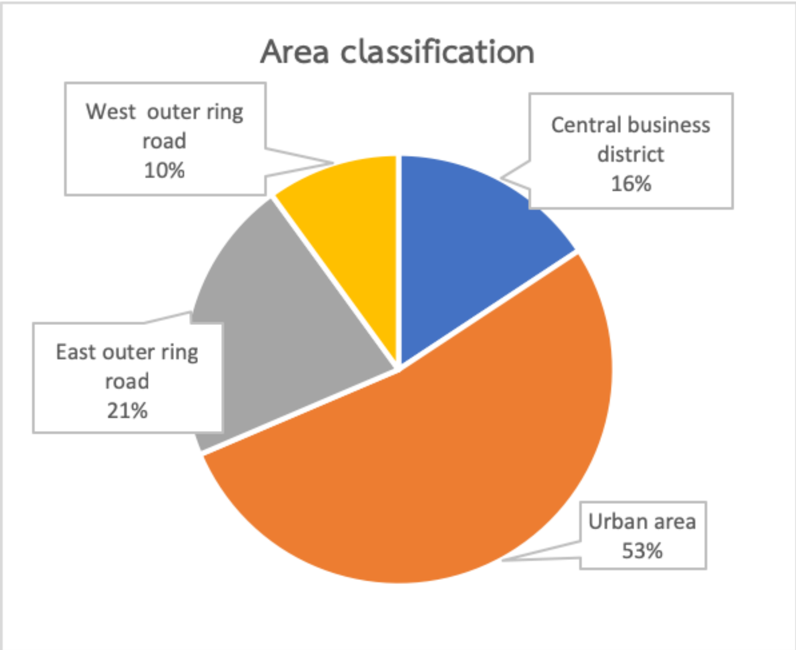


Figure 5.1 Collected data: Area Classification

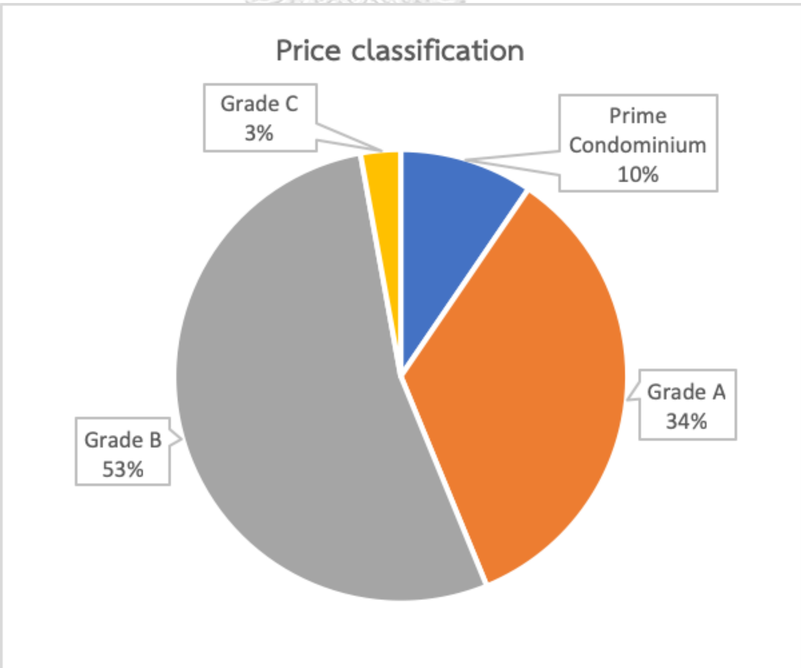
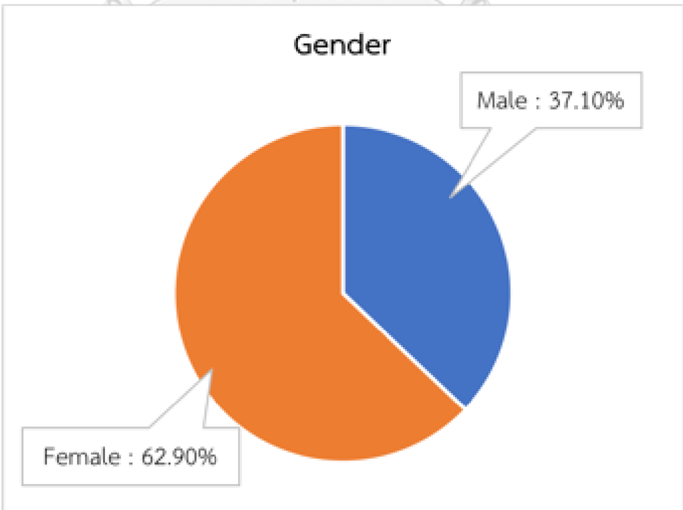


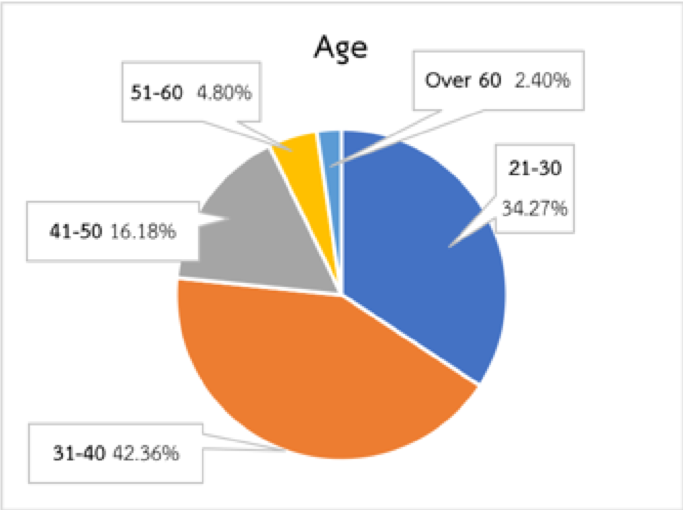
Figure 5.2 Collected data: Price Classification

Socio-demographic information of the survey data presents in Figure 5.3 using descriptive statistics. The survey data was collected from 210 respondents who live in condominium in Bangkok, Thailand. Majority of the respondents are female, around 63 percent, while 37 percent of respondent are male. The respondents are mainly between 31 to 40 years old, and the second largest group age are between 21 to 30 years old (about 42 percent and 34 percent, respectively). They mostly have education degree higher than a bachelor's degree, approximately 62 percent, but only 0.5 percent of the respondents was in lower Mattayom 6 (Grade 12). They have a personal income per month over 40,000 Thai baht (49.5%), working in private company (63.3%), and more likely owning their condominiums (70%). In brief, most of the respondents in condominiums are more female, more bachelor's degree educated, more in middle-aged people, typically employed in the private company, get paid above 40,000 baht a month, and the owner of their household.

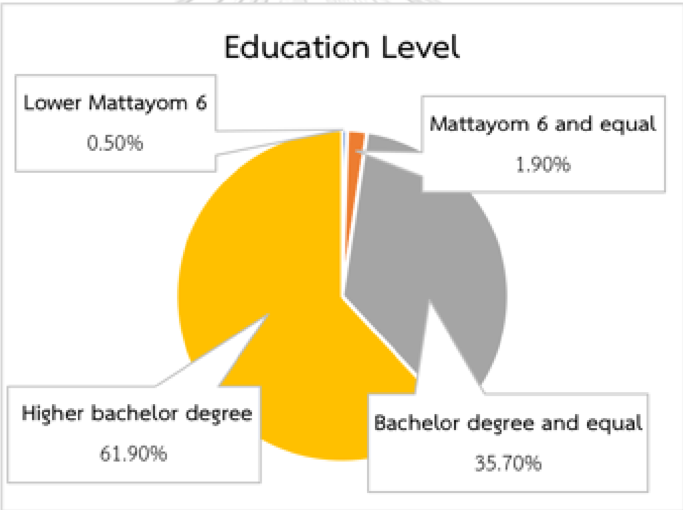
a.



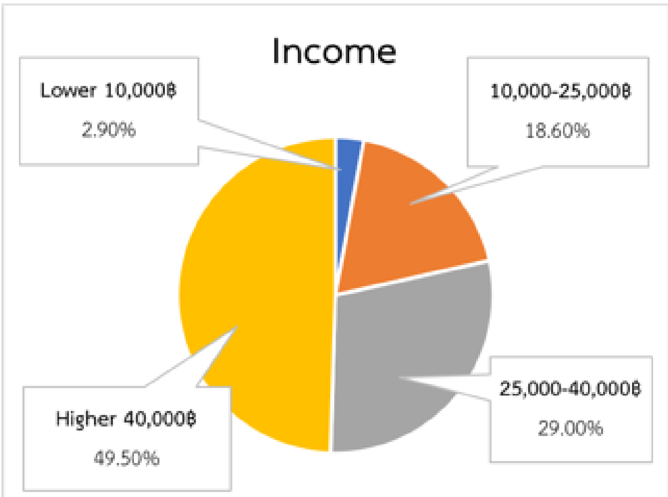
b.


Age
51-60 4.80%
Over 60 2.40%
21-30
34.27%
41-50 16.18%
31-40 42.36%

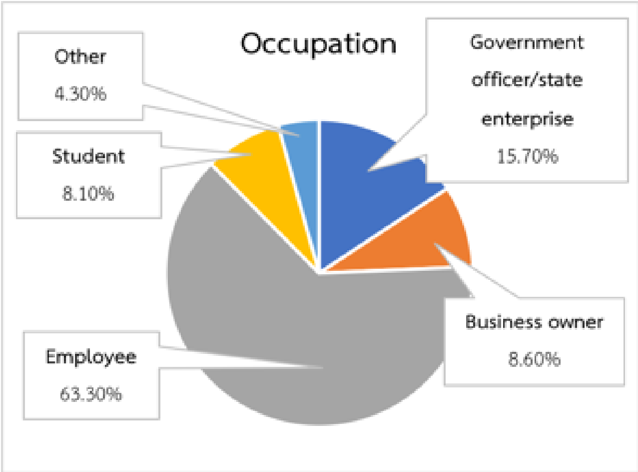
c.


Education Level
Lower Mattayom 6
0.50%
Mattayom 6 and equal
1.90%
Higher bachelor degree
61.90%
Bachelor degree and equal
35.70%

d.


Income
Lower 10,000฿
2.90%
10,000-25,000฿
18.60%
25,000-40,000฿
29.00%
Higher 40,000฿
49.50%

e.



f.

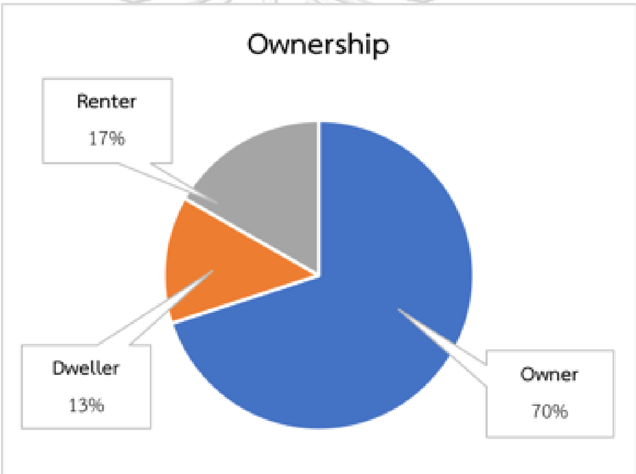


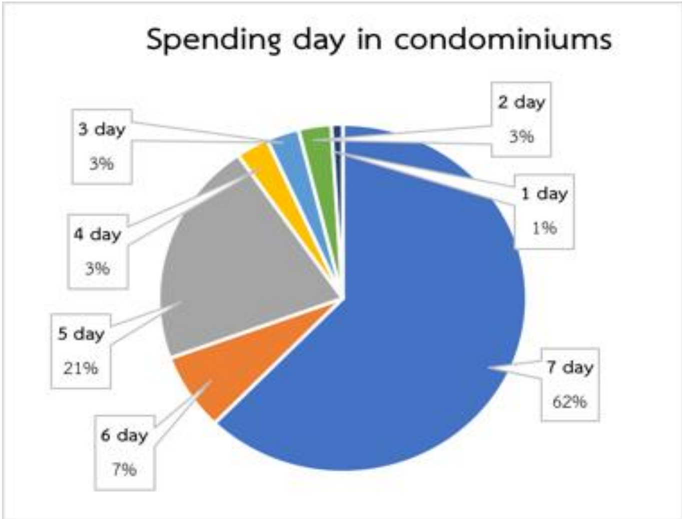
Figure 5.3 Socio-demographic information

(a) Gender (b) Age (c) Education Level (d) Income (e) Occupation (f) Ownership

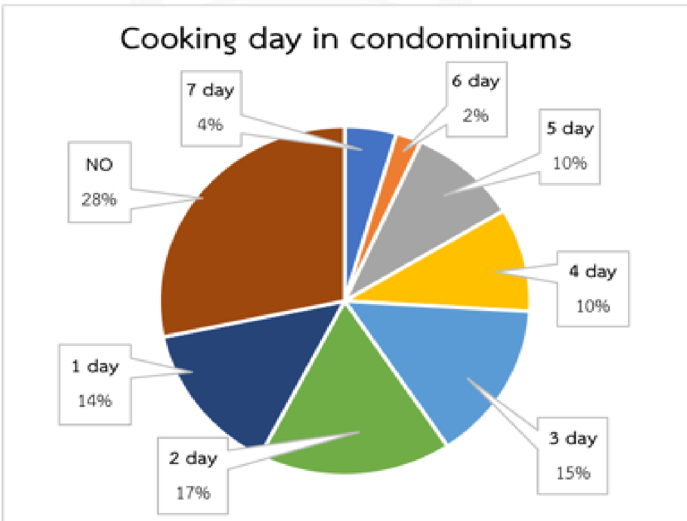
According to the survey, the respondents' opinions about their living patterns in their condominiums are indicated in Figure 5.4. The results show that the majority of resident was more likely to stay at the condominium over 7 days (62.7%), whereas 21.1 percent of respondents remained in the condominium only 5 days. It can be implied that some respondents in the condominium were not the permanent household.

The survey results revealed that 127 respondents (60.5%) reported that they cooked by themselves. Almost of respondent (80%) wash their clothes by themselves which 88% using washing machine, while 22% washing by hand. Evidently, water uses are related to many activities in household such as cooking, clothes washing, and take a shower etc. In addition, the respondents reported their water bill per month, and found that the average of water bill was 217.77 ± 346.73 baht.

a.



b.



c.

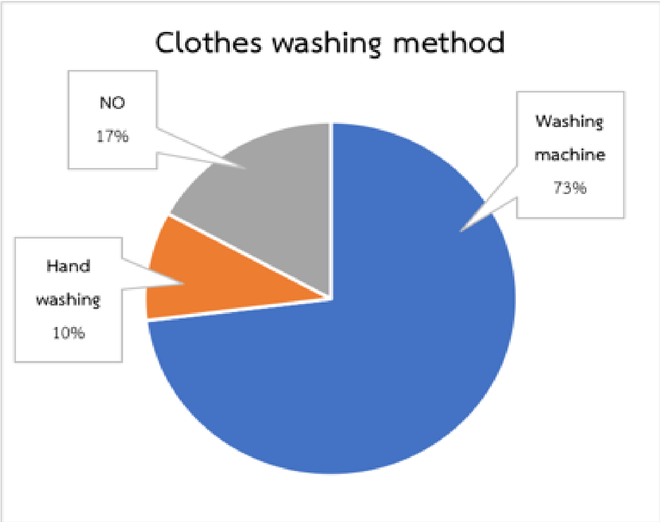


Figure 5.4 Living pattern of condominium residents (a) Spending day in condominiums (b) Cooking day in condominiums (c) Clothes washing method

5.2 Water conservation practices

Everyday water conservation behaviors

Water conservation behaviors based on respondents' water use behaviors are presented in Figure 5.5. Top two highest rate of practices are WC5 (making sure that the tap not drip), and WC1 (cleaning food scrapes before dish washing). Most of the respondents always performed these two water conservation behaviors. While 40% of respondents behaviors are 'always checking and changing the sanitary equipment (WC7). It can be implied that those two main behaviors (WC5, WC1) are involved in habitual factor which relate to repeatable behaviors. On the other hand, checking and changing the sanitary equipment (WC7) is uncommon behavior for some individuals. While consider WC2 (turning off tap during cleaning dishes) and WC3 (turning off tap during soaping), these behaviors had the two lowest rates of "always" answer. It can be suggested that these two behaviors are concerned about people's convenient, so people tend to ignore these responsibilities.

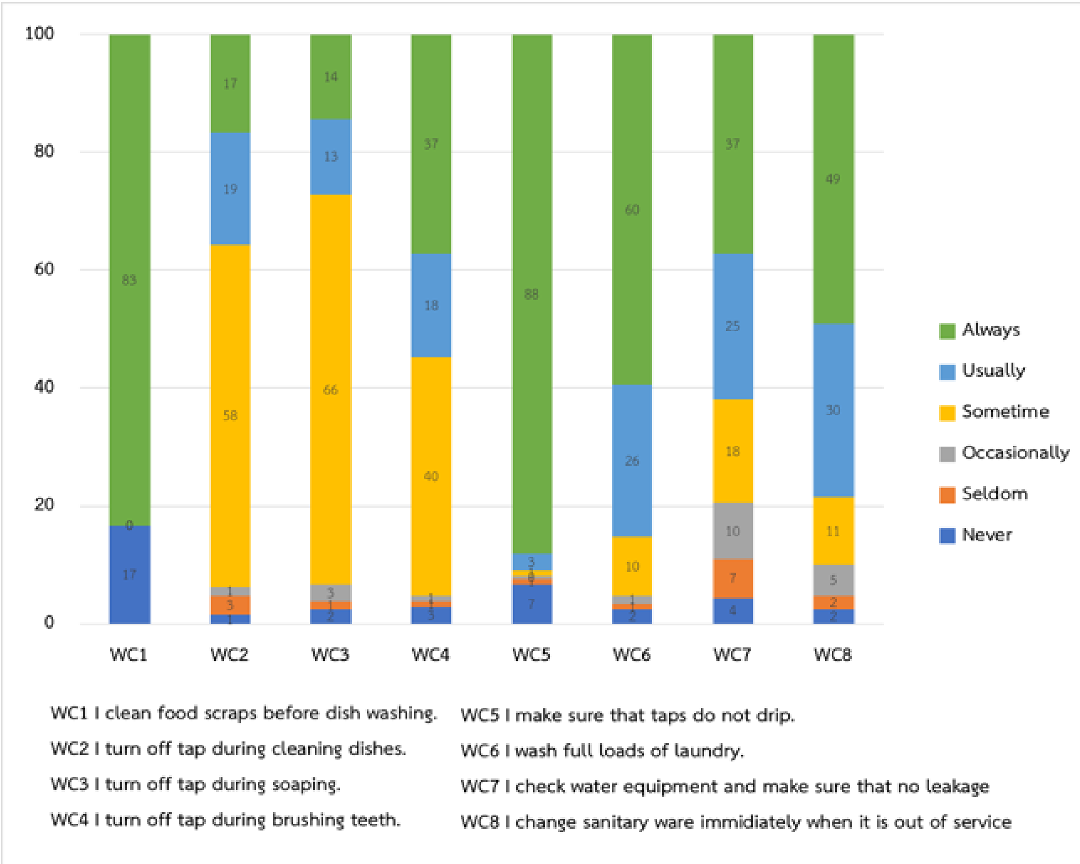


Figure 5.5 Everyday water conservation behaviors

One-time water conservation behaviors

Figure 5.6 presents one-time water conservation behaviors: installation of water saving devices in household. It can be seen that dual-flush water closet was the most using water saving equipment (over that 60%). Only 20% of the respondents used water saving water closet with single flush. The survey result indicates that the dual-flush toilet has been widely recognized by most people. Moreover, about 80% of respondents had not using the urinal in their condominium, it might be cause of cost saving during construction period. In accordance with the finding about clothes washing, the 38% of respondents who wash clothes by the machine chose to buy a water saving washing machine. However, installation of the sanitary wares has limitation based on the build in fixtures because the condominiums finally finished before moving in. As a consequence, the unit rooms' owners had no choice to change the equipment unless they pay for a renovation.

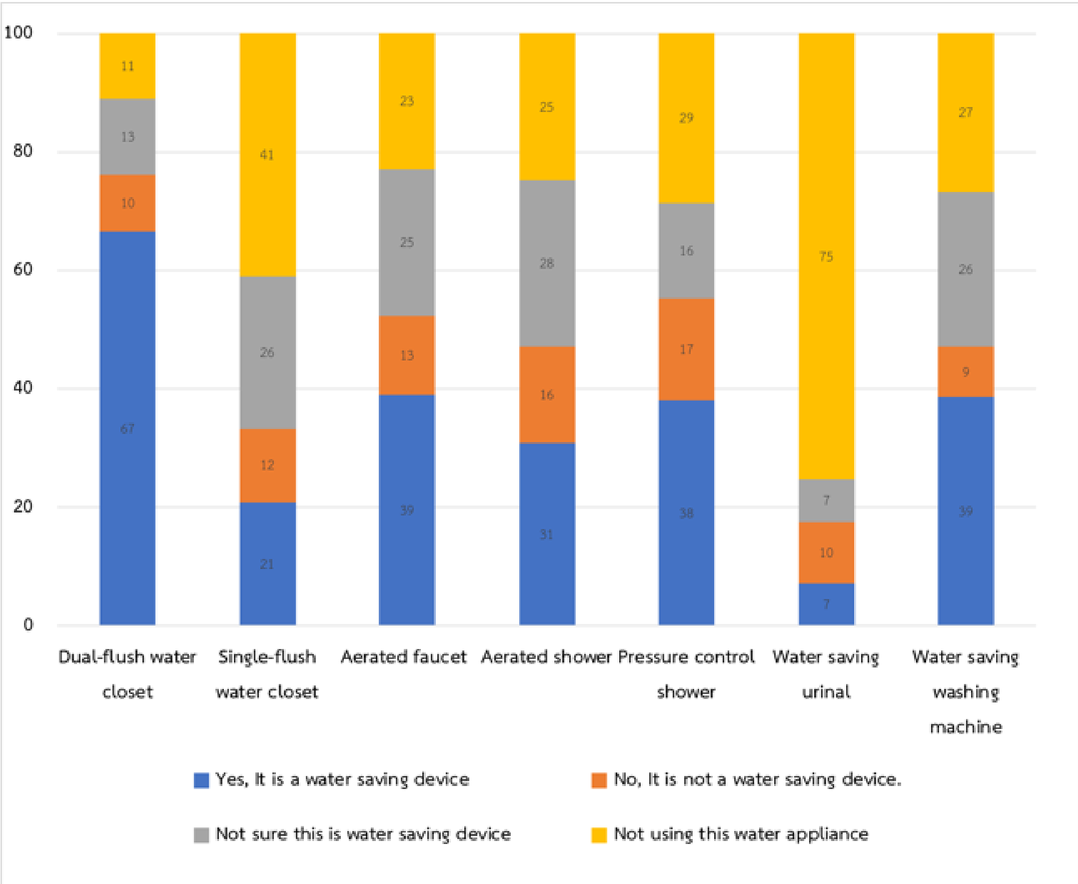


Figure 5.6 One-time water conservation behaviors

5.3 Effects of socio-demographic factors on everyday water conservation behaviors

To determine the effect of socio-demographic including gender, age, education level, income, occupation, and ownership on the everyday water conservation behaviors (WC1-WC8[a]), the non-parametric tests were applied. The non-parametric tests are suitable for actual data that were not normally distributed.

In accordance with our data, the Mann-Whitney test and Kruskal-Wallis test were used. The Mann-Whitney test is conducted to test two independent samples of the null hypothesis that the median of these groups is equal, in term of the parametric test. This test is called independent sample t-test group. Moreover, the Kruskal-Wallis test is to determine two or more independent group samples, in extension to the Mann-Whitney test, that identify whether at least one sample dominate from others. The parametric test relating to the Kruskal-Wallis test is one-way ANOVA. After confirmation of the sample dominance, the post hoc or the multiple comparison test is used to find out which sample is different. Analyses of socio-demographic effects are described as:

Effect of gender

Table 5.1 shows the gender effects on the everyday water conservation behaviors (WC1-WC8[a]). The Mann-Whitney test was conducted to compare medians of male and female on the WC1-WC8. There was not a significant difference in the practices rate between man and woman, according to p-value that is more than 0.05. For instance, WC1[a] has p-value as 0.986 which is considered as no significant difference between men and women. This result also supports the average scores of male and female groups which are 5.74 and 5.76, respectively, the score shows very minimal gap. Moreover, in other behaviors, they show similar trends.

[a] According to Figure 5.3

This finding is inconsistent with Wolters (2014), which gender showed a statistically significant effect of water conservation behaviors using logistic regression analysis. As a result, women were more likely to perform water conservation behaviors. Moreover, in the study of pro-environmental behaviors-a case study in Tokyo and Seoul, the result confirm that female practices rate is significantly higher that male on the behaviors, such as taking short showers and cutting down on the frequency of washing clothes (Lee, Kurisu, & Hanaki, 2013).

Table 5.1 The effect of socio-demographic: gender

Behavior number	Gender				
	Mann-Whitney		Average		High practice
	U	p	Male	Female	
WC1 [a]	5153	0.986	5.74	5.76	-
WC2 [a]	5277	0.757	3.85	3.85	-
WC3 [a]	5540	0.349	3.44	3.18	-
WC4 [a]	5553	0.325	4.49	4.35	-
WC5 [a]	5096.5	0.830	5.67	5.46	-
WC6 [a]	4648.5	0.181	5.50	5.22	-
WC7 [a]	4886.5	0.523	4.74	4.65	-
WC8 [a]	5170.5	0.954	5.13	5.01	-

Note: Significant *p* value was indicated by asterisk (*p* value < 0.05).

<u>*Effect of age*</u>

Table 5.2 demonstrates the results of the age effects in the everyday water conservation behaviors (WC1-WC8 [a]). The Kruskal-Wallis test was applied and found

[a] According to Figure 5.3

that WC1, WC2, WC3, WC4[a] show significantly different practice rate. According to WC2[a], the Kruakal Wallis is significant, p value < 0.05 (λ^2=12.653, p=0.013), and a post hoc (multiple comparison) test is conducted to show difference in practice rates. The higher rate of the water conservation behaviors in older people is reported.

These results are consistent with the previous study of Clark and Finley (2007) that high age significant intended to perform water saving behaviors. As Lee et al. (2013) confirmed that the elder respondents performed higher of practice rate on taking short showers and turning off the water washing face and brushing teeth than younger respondents.

Table 5.2 The effect of socio-demographic: age

Behavior number	Age					
	One-way ANOVA		Kruakal Wallis		Multiple-comparison	
	p	Test of homogeneity of variance	λ^2	p	M	Interpretation
WC1 [a]	0.340	0.000	10.343	0.035*	-	-
WC2 [a]	0.011*	0.590	12.653	0.013*	G12	20S<40S<30S<60S<50S
WC3 [a]	0.016*	0.871	11.333	0.023*	G12	20S<50S<60S<30S<40S
WC4 [a]	0.002*	0.001	17.986	0.001*	G12	20S<30S<40S<60S<50S
WC5 [a]	0.742	0.061	1.269	0.867	-	-
WC6 [a]	0.289	0.023	4.91	0.297	-	-
WC7 [a]	0.071	0.107	12.014	0.017*	-	-
WC8*[a]	0.42	0.156	7.122	0.13	-	-

Note: Significant *p* value was indicated by asterisk (*p* value < 0.05).

[a] According to Figure 5.3

<u>Effect of education level</u>

Table 5.3 shows the effect of education level to the everyday water conservation behaviors. The statistic test that the education level significantly effects on the WC1- cleaning food scrapes before dish washing, on the other hand, there are significant impact on other behaviors (WC2-WC7 [a]). In term of WC1[a], the Kruakal-Wallis test was applied which λ^2 is 8.769 and p is 0.033 ($p < 0.05$), it considered to have significant result. This WC1[a] present significantly different rate in levels of education (lower than Mattayom 6, Mattayom 6 and equal, bachelor's degree and equal, higher bachelor's degree). However, the result of one-way ANOVA (Test of homogeneity of variance) did not significant, 0.314 which lower than 0.05, the multiple-comparison could not complete.

The current finding is not consistent with earlier research indicating that the level of education can influence the people to perform environmentally friendly action. Gilg and Barr (2006) identified the environmentalist's characteristic related to higher education.

On the other hand, our research findings coincide with Fielding et al. (2012) claimed that the education level did not a significant predictor of household water conservation.

[a] According to Figure 5.3

Table 5.3 The effect of socio-demographic: education level

Behavior number	Education level					
	One-way anova		Kruakal Wallis		Multiple-comparison	
	p	Test of homogeneity of variance	λ^2	p	M	Interpretation
WC1 [a]	0.582	0.314	8.769	0.033*	-	-
WC2 [a]	0.870	0.18	0.843	0.839	-	-
WC3 [a]	0.320	0.191	3.409	0.333	-	-
WC4 [a]	0.350	0.034	2.721	0.437	-	-
WC5 [a]	0.694	0.613	2.224	0.527	-	-
WC6 [a]	0.250	0.089	2.212	0.530	-	-
WC7 [a]	0.274	0.012	3.538	0.316	-	-
WC8 [a]	0.025	0.196	7.444	0.059	-	-

Note: Significant *p* value was indicated by asterisk (*p* value < 0.05).

Effect of income

Table 5.4 shows the effect of income to the everyday water conservation behaviors. According to the Kruskal-Wallis test, the income factor has only impact on the WC1- cleaning food scrapes before dish washing. As indicating by Kruakal Wallis test, λ^2=11.633, p-value = 0.009, this test reveals a significant different (p < 0.05), however, the multiple comparison did not complete, the condition of ANOVA test did not approve. In other behaviors, the income factor has no significant effect on the other behaviors (WC2-WC8 [a]), according to p-value (significant p value was lower than 0.05)

[a] According to Figure 5.3

The results obtained of WC2-WC8 do not support the finding of Wolters (2014) who found income had the most predictor of water conservation behaviors, the statistic results confirmed significant effects on seven water conservation behaviors out of eleven water conservation behaviors. Moreover, Willis et al. (2013) confirmed that the more income increase, the more water consumption is.

Table 5.4 The effect of socio-demographic: income

Behavior number	Income					
	One-way anova		Kruakal Wallis		Multiple-comparison	
	p	Test of homogeneity of variance	λ^2	p	M	Interpretation
WC1 [a]	0.298	0.157	11.633	0.009*	-	-
WC2 [a]	0.144	0.033	5.718	0.126	-	-
WC3 [a]	0.352	0.117	3.48	0.323	-	-
WC4 [a]	0.075	0.893	7.034	0.071	-	-
WC5 [a]	0.576	0.061	2.267	0.519	-	-
WC6 [a]	0.568	0.373	4.001	0.261	-	-
WC7 [a]	0.381	0.48	4.356	0.225	-	-
WC8 [a]	0.991	0.342	1.779	0.619	-	-

Note: Significant *p* value was indicated by asterisk (*p* value < 0.05).

<u>*Effect of occupation*</u>

Table 5.5 presents the effect of occupation to the everyday water conservation behaviors. According to the Kruskal-Wallis test, the occupation factor has only significantly different practice rates on WC1[a] and WC4[a], the Kruakal Wallis

[a] According to Figure 5.3

test show p-value as 0.033 and 0.041, respectively ($p < 0.05$). One-way ANOVA reveals a significance across the group of occupation and multiple comparison (a post hoc) test show that the other occupation group (excluding government officer, business owner, employee, and student) shows the highest of practice rate on WC4[a], whereas the student shows the lowest practice rate on this action.

The finding of WC4 [a]- turn off tap during brushing teeth is in contrast with the results by Gilg and Barr (2006) who found the identity of committed environmentalists who engage in water saving activities was significantly more likely to be a member of a community organization.

Table 5.5 The effect of socio-demographic: occupation

Behavior number	Occupation					
	One-way anova		Kruakal Wallis		Multiple-comparison	
	p	Test of homogeneity of variance	λ^2	p	M	Interpretation
WC1 [a]	-	0.000	10.501	0.033*	-	-
WC2 [a]	0.235	0.053	5.757	0.218	-	-
WC3 [a]	0.318	0.341	0.306	0.306	-	-
WC4 [a]	0.002*	0.000	9.953	0.041*	G12	Stu.<Employee<Business<Gov. <other
WC5 [a]	0.872	0.238	1.749	0.782	-	-
WC6 [a]	0.898	0.799	1.419	0.841	-	-
WC7 [a]	0.96	0.388	0.935	0.919	-	-
WC8 [a]	0.614	0.939	4.269	0.371	-	-

Note: Significant *p* value was indicated by asterisk (*p* value < 0.05).

[a] According to Figure 5.3

Effect of ownership

Table5.6 shows the effect of ownership to the everyday water conservation behaviors. The ownership effect has no statistically significant to the behaviors, according to the Kruakal Wallis test, all of the p-value are over than 0.05 (p value < 0.05, significant)

Our result differs from the previous research that reported by Russell and Fielding (2010). The finding pointed out the ownership status, the owners tend to manage their water consumption effectively such as engaging in water conservation behavior or installation of water saving devices.

Table 5.6 The effect of socio-demographic: ownership

Behavior number	Ownership					
	One-way Anova		Kruakal Wallis		Multiple-comparison	
	p	Test of homogeneity of variance	λ^2	p	M	Interpretation
WC1 [a]	0.953	0.679	0.877	0.645	-	-
WC2 [a]	0.444	0.455	1.530	0.465	-	-
WC3 [a]	0.623	0.864	1.086	0.207	-	-
WC4 [a]	0.221	0.288	3.200	0.464	-	-
WC5 [a]	0.604	0.12	0.441	0.802	-	-
WC6 [a]	0.318	0.279	1.548	0.461	-	-
WC7 [a]	0.435	0.146	0.968	0.616	-	-
WC8 [a]	0.69	0.533	0.630	0.730	-	-

Note: Significant p value was indicated by asterisk (p value < 0.05).

[a] According to Figure 5.3

Summary

Table 5.7 provides summary statistics of socio-demographic effects on everyday water conservation behaviors (WC1-WC8 [a]). The results confirmed that age, education level, income, and occupation have significant influence on the behaviors, whereas gender and ownership status have no significant effect on the behavior. However, the relationship of these factors and the practice rate of behaviors is not uniform, the statistical model explain roughly 9% of socio-demographic effect on the water conservation behaviors (Wolters, 2014). The possible explanation depends on the characteristics of samples, and some affecting factors such as water conservation policy, technological tools, water conservation knowledge etc. Therefore, other influencing factors need to be considered.

Table 5.7 Summary of sociodemographic on everyday water conservation behaviors

Behavior number	Sociodemographic factors					
	Gender[1]	Age[2]	Education level[2]	Income[2]	Occupation[2]	Ownership[2]
WC1 [a]	0.986	0.035*	0.033*	0.009*	0.033*	0.645
WC2 [a]	0.757	0.013*	0.839	0.126	0.218	0.465
WC3 [a]	0.349	0.023*	0.333	0.323	0.306	0.207
WC4 [a]	0.325	0.001*	0.437	0.071	0.041*	0.464
WC5 [a]	0.830	0.867	0.527	0.519	0.782	0.802
WC6 [a]	0.181	0.297	0.530	0.261	0.841	0.461
WC7 [a]	0.523	0.017*	0.316	0.225	0.919	0.616
WC8 [a]	0.954	0.13	0.059	0.619	0.371	0.730

Note: Significant *p* value was indicated by asterisk (*p* value < 0.05). 1 Mann-Whitney test 2 Kruakal Wallis test [a] According to Figure 5.3

5.4 Affecting factor to the water conservation behaviors

Measurement of the affecting factors included attitude, social norm, perceived behavioral control and information effect to the water conservation behaviors was being investigated. The certain behaviors involved in everyday water conservation and one-time water conservation behavior. In addition, the respondents were asked with a series of 26 questions regarding the factors from 210 residents. Each item was scored on a seven-point Likert scale from strongly disagree (-3) to strongly agree (3). The results are shown as following Tables 5.2.

5.4.1 Everyday water conservation

Table 5.8 demonstrates level of agreement on the influencing factors of everyday water conservation behaviors.

Effect of attitude factors

Firstly, attitudinal factor was examined. It is evident that most of the respondents had very positive attitude on water conservation issue with average score on 2.19 of 3. Around 92% of the respondents believed that water saving is important and is their responsibility. Moreover, they felt that the consequence of water saving can cause water shortage. The highest average score is 2.19/3.00 among other variables. These results agree with other studies which show positive attitude toward water conservation behavior of household in UK and Australia. While, 83% of UK participants stated that they concerned about the necessity to save water in household (Kelly & Fong, 2015). Moreover, 97% of Australian respondents pointed out the positive attitude of the importance of water conservation and 94% of the respondents agreed on the necessity to save water because of water shortage (Dolnicar & Hurlimann, 2010).

Table 5.8 Level of agreement on psychosocial factors of everyday water conservation behaviors

Latent variables	Observed variables	Level of agreement: Strongly disagree (-3)	←		Neutral (0)	→		Strongly agree (3)	Average
Attitude	I believe that water conservation is important and necessary.	0.0%	0.0%	2.4%	4.8%	14.3%	27.6%	51.0%	2.20
	I believe that water conservation is my responsibility.	0.0%	1.0%	2.4%	3.8%	11.9%	31.4%	49.5%	2.19
	I believe that water conservation can release water shortage effect.	0.0%	0.5%	1.9%	6.7%	14.8%	23.8%	52.4%	2.17
Social Norm	People I know think water conservation is important.	0.0%	1.0%	4.3%	8.1%	16.2%	27.1%	43.3%	1.94
	I feel others would be proud of me if I make an effort to conserve water.	2.9%	2.4%	5.2%	21.9%	21.0%	27.6%	19.0%	1.15
	My friends and family want me to conserve water.	2.9%	1.9%	4.3%	18.1%	17.6%	25.2%	30.0%	1.41
Perceived behavioral control	At home, saving water is easy to me.	0.0%	0.0%	2.4%	8.1%	11.0%	31.4%	47.1%	2.13
	I think that water saving is not consuming my time.	5.7%	4.8%	1.4%	7.1%	10.5%	20.5%	50.0%	1.73
	I can control my water consumption in my condominium.	0.0%	1.4%	2.4%	8.1%	20.0%	35.7%	32.4%	1.83
Information effect	I made this year to look for information on water conservation.	8.1%	7.1%	7.6%	29.0%	21.0%	16.2%	10.5%	0.39
	I seen or heard information about water conservation from each of following sources in	4.3%	8.1%	5.7%	20.5%	26.7%	21.0%	13.8%	0.75
	I come across information on saving water how much attention do you give it.	1.4%	3.8%	2.9%	15.7%	26.7%	27.6%	21.9%	1.33
Intention	I intent to conserve water in the next six months.	0.5%	0.5%	2.9%	12.9%	19.5%	24.3%	39.5%	1.81

Effect of social norm factor

Next, social norm factor which related to a social support of an influencer on them, the finding reveals that the people also had favorable responds on this factor. 87% of respondents indicated that people they know think that water conservation is important, while only 5% of respondents disagreed with this statement. 67% of overall respondents felt that others would be proud of me if they try to conserve water. And most of them (73%) accepted that their friends and family want them to conserve water. The average score of this variable was 1.50/3.00 which was lower than the attitude. Our results accord with Fielding et al. (2012) who found that the mean score of subjective norm items was 5.70/7.00 indicated as positive support on social norm.

Effect of perceived behavioral control factor

Along with the previous variables, perceived behavioral control variable which described as how easy or difficult to perform the behavior was reported on positive agreement. They mainly felt that saving water was easy (89%) and not consuming their time (81%). They could control their water consumption in their residence (88%). The mean score was the second highest score at 1.90/3.00. The finding accords with earlier study indicating that the mean score of perceived behavioral control item was 4.19 of 5 which was favorable agreeable on this factor (Perren & Yang, 2015). It can be explained that the respondents felt easy to perform these water saving behaviors in every day.

Effect of information effect factor

In term of information effect factor relating to seeking, exposure, and attention about the water conservation issue, 47% of respondents reported that they seek for information on water conservation. 61% of respondents have seen or heard information about water conservation from available source such as internet, television, radio, family, and friend. And most of them (76%) pay attention on water conservation issue when they have noticed. The average score, 0.82/3.00, was the lowest score. It is interesting that the seeking information item had only 0.39 of 3.00, which can imply a low effort to look for information on water conservation. However, according to Trumbo and O'Keefe (2005), the information factor plays an important to promote water saving pattern. The finding presented that the water conservation behavior was strongest predicted by the information factors.

Intention to the everyday water conservation behavior

Lastly, evaluation of the intention to perform everyday water conservation, they were very agreeable to conserve water in the next six months. 83% of the respondents were on positive side to perform the everyday water conservation behaviors, but only 3.8% of the respondents were on the negative side. Consequently, the average score of this variable was 1.81/3.00 which is high.

Summary

In summary, most of respondents had positive agreement on these factors, attitude toward behaviors, social norm, perceive behavioral control, and information effect, affecting everyday water conservation behaviors. According to Table 5.10, it demonstrates the average score on different variables. The top mean score is the attitude toward behavior, 2.19/3.00, and the secondary mean scores are perceived behavioral control and social norm, 1.90 and 1.50 from 3.00, respectively. The last rank of factor is information effect factor, 0.82/3.00. As seen in the order of the factors above, it seems that the most influencing factor on the intention to everyday water conservation behavior is likely to be attitude toward behavior which this correlation must be investigated in the following result. However, the other research suggested that the positive of attitude did not always affect to the behavior but encouraging useful information as well as knowledge of water situation would be possible to change water saving behaviors. (Kelly & Fong, 2015)

5.4.2 One-time water conservation

Table 5.9 presents level of agreement on psychosocial factors of one-time water conservation behaviors relating to water saving installation in household.

Table 5.9 Level of agreement on psychosocial factors of one-time water conservation behaviors

Latent variables	Observed variables	Level of agreement							Average
		Strongly disagree (-3)	←		Neutral (0)	→		Strongly agree (3)	
Attitude	I believe that water saving appliances can actually save water.	0.5%	0.5%	2.4%	8.1%	16.2%	35.7%	36.7%	1.93
	I believe that water saving appliances are necessary for every household.	0.5%	1.0%	1.4%	13.8%	18.1%	34.8%	30.5%	1.74
	I believe that installation of water saving appliances can release water shortage effect.	1.0%	1.0%	1.0%	7.1%	19.0%	36.2%	34.8%	1.90
Social Norm	People I know think that installing water saving appliances is good to environment.	3.3%	2.9%	5.7%	28.6%	21.9%	17.6%	20.0%	0.96
	My friends and family agree with me to install water saving appliances.	1.4%	1.9%	2.9%	31.9%	25.7%	18.1%	18.1%	1.05
	My friends and family want me to install water saving appliances.	4.3%	2.9%	3.8%	26.2%	23.3%	21.9%	17.6%	0.98
Perceived behavioral control	It is easy to find and buy water saving appliances.	0.5%	5.2%	3.3%	32.4%	22.4%	21.4%	14.8%	0.94
	I think that installing of water saving appliances is not complicated.	6.2%	8.1%	11.4%	30.5%	20.0%	13.8%	10.0%	0.31
	I can choose to install or retrofit water saving appliances in my condominium.	7.1%	10.0%	15.7%	21.0%	23.3%	14.3%	8.6%	0.20
Information effect	How much effort have you made this year to look for information on water saving devices?	5.7%	8.6%	10.0%	28.1%	21.9%	14.8%	11.0%	0.40
	How much information about water saving devices have you seen or heard from each of following	6.2%	5.7%	9.0%	21.0%	28.1%	18.6%	11.4%	0.60
	When you come across information on water saving devices how much attention do you give it?	1.0%	4.8%	4.8%	20.0%	29.0%	27.6%	12.9%	1.06
Intention	I intent to install water saving appliances, if I have a chance to re-install water appliances in my house.	1.0%	2.9%	2.4%	8.6%	20.5%	25.2%	39.5%	1.79

Effect of attitude factors

As can be seen, there were positive responding on attitude toward behavior, approximately 80%-90% on three observed variables, which was consistent with the result of the previous behavior. 90% of respondents agreed on the statement of "I believe that installation of water saving appliances can release water shortage effect" which was the highest agreement.

Moreover, the mean score was the highest rank among other variables, 1.86 of 3.00 as shown in Table 5.10. It can be implied that the respondents believed in installation of water saving devices has benefit to environment.

Effect of social norm factor

Next, social norm factor related the perception of social support to install water saving appliance, the positive agreements were around 59%-62% on three measured variables which was less than the attitude variables. The mean score was 1.00 of 3.00 which was the second highest rank. Most of the respondents thought that their friend and family wanted them to install the water saving device in their household. According to Lam (2006), this author revealed that the social norm was significantly predicted the intention to install a dual-flush toilet at home.

Effect of perceived behavioral control factor

Perceived behavioral control variable had the lowest mean score, approximately 0.49, which was lower than the previous behaviors. Only 50% of respondents were positive agreement on perception of resource and opportunity that support the water saving installation in household. As can been seen the responds, to install the water saving devices appears to be not simple for the resident in condominium, in other word, people seem to have no choice for the sanitary wares in their condominium. The options for these devices were quite limited due to a condominium's developer during a construction phase.

Effect of information effect factor

Regarding the information effect about water saving devices, most of respondents had positive agreement around 58%, whereas they had negative agreement around 19% which was higher that other variables. They had 47% positive opinions on making effort to looking for water saving information, and 58% of respondents confirmed that they got information about water saving information from different sources. Also, 69% of respondents agreed that they pay attention the water saving device information. The mean score of information effect items were 0.69 of 3.00.

In term of an increasing of negative opinion on this variable, it seems that support more convincing information or knowledge to adapt their behaviors is necessity. For instance, the involving agency should adapt communication channels about water saving in order to reach more users. The consumers can gain impact of the information that can influence their performance.

Intention to the everyday water conservation behavior

Lastly, the intention of installation water saving devices was measured. There was 85% of the supportive intention to install water saving appliance in their condominium. And the score on this intention item was 1.79 of 3.00 which was very high comparing to other items. It is interesting that most respondents may believe that to install the water saving devices can bring about more benefits to their household.

Summary

In summary, most of respondents were positively agreed on the influencing factors of water saving installation. They also had the intention if they had a chance to re-install water appliances in their house. As shown in Table 5.10, it presents the mean score of the affecting variables on installation of water conservation appliances in household. The highest score was the attitude toward behaviors, 1.89 of 3.00., whereas following places were subjective norm, information affect, and perceive behavioral control, 1.00, 0.69, 0.49 of 3.00, respectively. The highest score of the variables is still attitude as the same as the previous behaviors, on the hand the lowest score of the variables is perceived behavioral control as not the same as the previous one. According to this targeted behavior, installation of the sanitary devices in a condominium have a limitation as explained above, it can cause of the lower score on the perceived behavioral control.

Table 5.10 The average score of the affecting factors on the water conservation behaviors

Behavior	Factor	Average score
Everyday water conservation behavior	Attitude	2.19
	Social norm	1.50
	Perceived behavioral control	1.90
	Information effect	0.82
one-time water conservation behavior	Attitude	1.86
	Social norm	1.00
	Perceived behavioral control	0.49
	Information effect	0.69

5.5 Confirmatory factor analysis

Confirmatory factor analysis (CFA) is to confirm relationship between observed and latent variables based on the theory framework. CFA refers to a technique to assess how well the observed items represent the constructs. According to this research, the constructs include attitude, social norm, perceived behavioral control, and information effect as factors that impact on the intention of water conservation behaviors (everyday water conservation behavior and one-time water conservation behaviors). Thus, there are two models developed by these study (1) model I for examining everyday water conservation behavior (2) model II for examining one-time water conservation behaviors

The dataset must be verified the reliability by Cronbach's alpha coefficient, and then CFA method was used to confirm and assess the measurement model. Amos and SPSS version 22 programs were applied.

5.5.1 Reliability

Reliability is the degree to describe dataset's consistency using Cronbach's alpha. Cronbach's alpha is commonly accepted in order to examine the internal consistency between observed variables (items) and latent variables. This test should be used before the confirmatory factor analysis and the structural equation model analysis. Generally, the acceptable consistency test requires a Cronbach's alpha above 0.6. And the good consistency test must obtain a Cronbach's alpha above 0.7 (Hair, Black, Babin, & Anderson, 2015). There are 2 steps of reliability test as follow:

Using SPSS program to test the reliability, firstly, all the item's results of each variable were brought to the program. If the Cronbach's alpha coefficient is higher than 0.6, it can be concluded that all of the items is reliable. Then, if the Cronbach's alpha coefficient is lower than 0.6, the item needs to be deleted by considering the Cronbach's Alpha. If Item Delete, the item that has this highest value must be deleted. In this study, the PBC2 and PBC5 need to be deleted to gain acceptable Cronbach's alpha. The deleted item is unreliable and outlier that is not suitable to analyze in the later process.

Result of Cronbach's alpha coefficients

As show in Table 5.11 - 5.12, Cronbach's alpha coefficients present relatively good scale reliability for both models. All of the Cronbach's alpha values, except the perceived behavioral control (PBC), was above 0.7 which have good consistency. While considering the PBC, one item must be deleted in order to gain higher alpha value in both models. After remove the item, in model I, the alpha value shows better scale reliability, and in the model II, the alpha value also presents high alpha scale, which is 0.645 as acceptable. These distinct result in the PBC items may be explained by the low content understanding and low consistency of the PBC items, so that the items must be considerably improved for further research.

Table 5.11 Cronbach's alpha coefficient for each of the variable for the model I: everyday water conservation behavior

Variables	No. of item	Cronbach's alpha
Attitude	3	0.900
Social norm	3	0.782
Perceived behavioral control	2	0.729
Information effect	3	0.797

Table 5.12 Cronbach's alpha coefficient for each of the variable for the model II: one-time water conservation behavior

Variables	No. of item	Cronbach's alpha
Attitude	3	0.926
Social norm	3	0.903
Perceived behavioral control	2	0.645
Information effect	3	0.839

5.5.2 Assessing measurement model validity

The objective of CFA is to test how well the observed items reflect the latent variables by assessment of the **construct validity and overall model fit** of a proposed model.

Construct validity

The construct validity is the degree to confirm a group of observed items represent the latent variables in other word. It shows how well the theory fits the data. It also provides the accuracy of the measurement model. To indicate the construct validity, it involves two components; convergent validity and discriminant validity.

Firstly, convergent validity is the indicator of convergent scale between the items and latent variables. The measure is described below;

1. *Factor loadings* is an indicator of correlation coefficients between observed variables and latent variables. High loading factor can indicate how well the item converge on latent variables. The standardized loading should be 0.5 or higher. (Hair et al., 2015)
2. *Construct reliability (CR)* is to indicate the internal consistency of the latent construct. This reliability must be between 0.6 and 0.7, suggested as acceptable, and 0.7 and higher, suggested as good (Hair et al., 2015). It is determined from the square sum of factor (L_i) for each latent variable and the sum of error variance terms for a construct (e_i) as:

$$CR = \frac{\left(\sum_{i=1}^{n} \mathrm{L}_i\right)^2}{\left(\sum_{i=1}^{n} \mathrm{L}_i\right)^2 + \left(\sum_{i=1}^{n} \mathrm{e}_i\right)}$$

L_i = the standardized factor loading of each item

i = the number of each item

n = the amount of items

e_i = the error variance terms for a construct

3. *Average variance extracted (AVE)* is calculated as the mean variance extracted of the items on latent variables and is an indicator of the convergence between observed items and the construct. The value must be 0.5 and higher, which is good convergence. (Hair et al., 2015) This value can be determined as:

$$AVE = \frac{\sum_{i=1}^{n} L_i^{\ 2}}{n}$$

L_i = the standardized factor loading

i = the number of items

n = the amount of items

Secondly, discriminant validity refers to the extent to which the latent variable is uncorrelated or distinct between any two latent variables. High discriminant validity can explain that variable is distinctive. This validity can be measure by maximum shared variance (MSV) and average shared variance (ASV) which the condition is obtained as (1) MSV < AVE (2) ASV < AVE. According to the adequate reliability and validity scale as mentioned, the model results are explained.

<u>Overall model fit</u>

In evaluating the model fit of the confirmatory factor analysis, we examine the parameters as follow; λ^2 (Chi-square), λ^2/df, CFI (comparative fit index), GFI (goodness of fit), AGFI (adjusted goodness of fit), and RMSEA (root-mean-square error of approximation), the criterion of model fit as shown in Chapter 3. The results of model fit are presenting as following.

Result of model validity

Model I (Everyday water conservation behaviors)

Table 5.13 demonstrates Convergent validity and discriminant validity of measurement model I: everyday water conservation behaviors. As can be seen, all factor loadings are between 0.66 to 0.933 which are classified as acceptable. CR are around 0.711 – 0.898 which are suggested as good and AVE are 0.554 - 0.748 which are suggest as good convergence. Considering about the discriminant validity measurement (MSV and ASV), these values meet the condition as lower than the AVE, except the PBC items.

Table 5.13 Convergent validity and discriminant validity of measurement: model I

Latent variables	Items	Factor loading	CR[1]	AVE[2]	MSV[3]	ASV[4]
Attitude	A1	0.933	0.898	0.748	0.642	0.420
	A2	0.896				
	A3	0.756				
Social norm	S1	0.659	0.801	0.575	0.419	0.360
	S2	0.812				
	S3	0.795				
Perceived behavioral control	P1	0.82	0.711	0.554	0.642	0.602
	P3	0.66				
Information effect	I1	0.774	0.809	0.585	0.563	0.436
	I2	0.762				
	I3	0.759				

Note [1] CR: Construct reliability [2] AVE: Average variance extracted [3] MSV: maximum shared variance [4] ASV: average shared variance

The result of confirmatory factor analysis in Figure 5.7 shown that all the factors of fit model are good, λ^2 = 76.774, λ^2/df = 1.760, CFI = 0.976, GFI = 0.938, AGFI = 0.892, and RMSEA = 0.058.

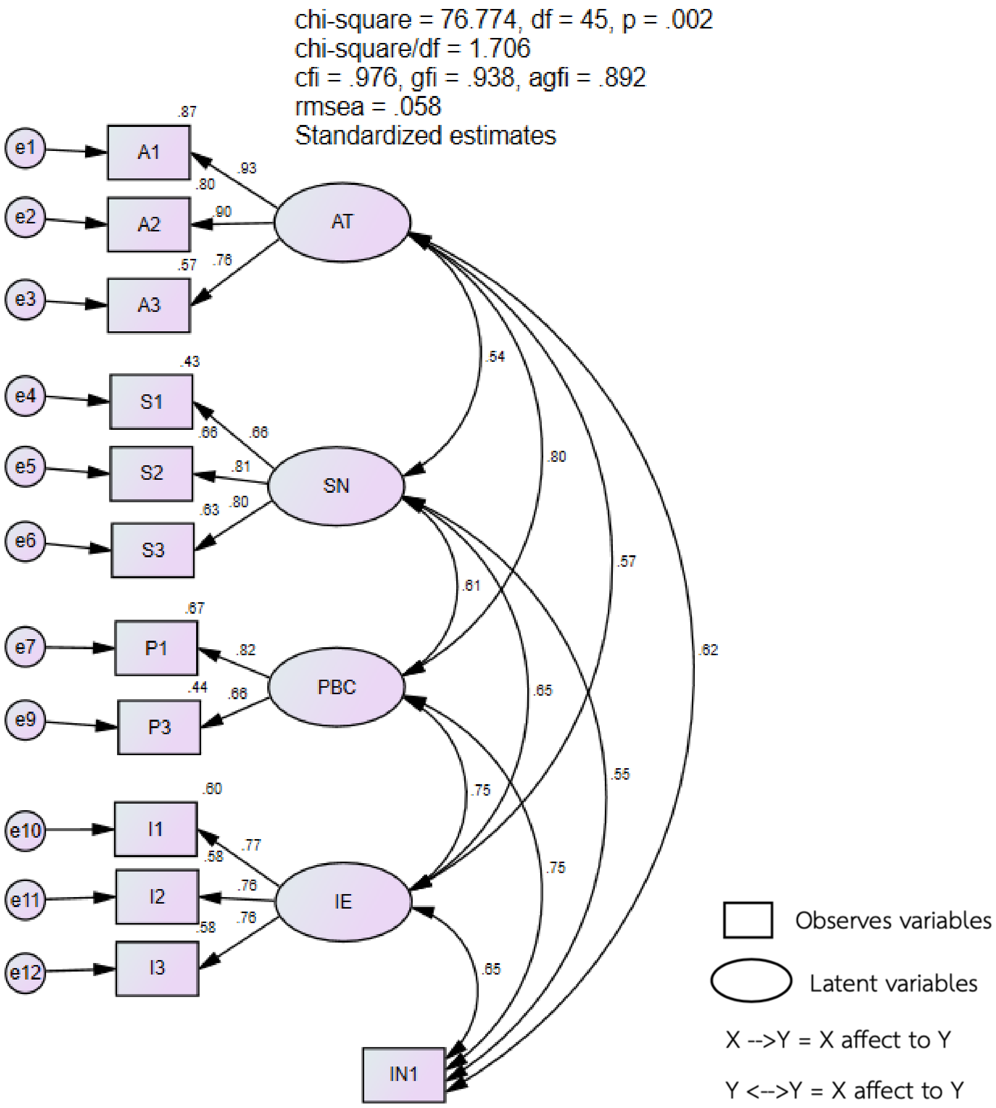


Figure 5.7 CFA result for model I: Everyday water conservation behaviors (Standardized Coefficient)

Note AT: Attitude SN: Social norm PBC: Perceived behavioral control IE: Information effect IN: Intention

<u>**Model II (One-time water conservation behaviors)**</u>

Table 5.14 demonstrates Convergent validity and discriminant validity of measurement model II: one-time water conservation behaviors. As can be seen except the PBC items, all factor loadings are between 0.824 to 0.928 which are classified as acceptable. CR are around 0.873 – 0.926 which are suggested as good and AVE are 0.696 - 0.806 which are suggest as good convergence. Considering about the discriminant validity measurement (MSV and ASV), these values meet the condition as lower than the AVE. The Convergent validity and discriminant validity of PBC items cannot meet the statistically criterion, however the others model fitness must be conducted.

Table 5.14 Convergent validity and discriminant validity of measurement: model II

Latent variables	Items	Factor loading	CR	AVE	MSV	ASV
Attitude	A4	0.851	0.920	0.792	0.384	0.266
	A5	0.89				
	A6	0.928				
Social norm	S4	0.895	0.926	0.806	0.450	0.318
	S5	0.897				
	S6	0.901				
Perceived behavioral control	P4	0.33	0.021	0.189	0.441	0.200
	P6	-0.518				
Information effect	I4	0.824	0.873	0.696	0.450	0.422
	I5	0.825				
	I6	0.853				

Note [1] CR: Construct reliability [2] AVE: Average variance extracted [3] MSV: maximum shared variance [4] ASV: average shared variance

The result of confirmatory factor analysis in Figure 5.8 shown that all the factors of fit model are acceptable, λ^2 = 44.481, λ^2/df = 0.988, CFI = 1.000, GFI = 0.966, AGFI = 0.941, and RMSEA = 0.000.

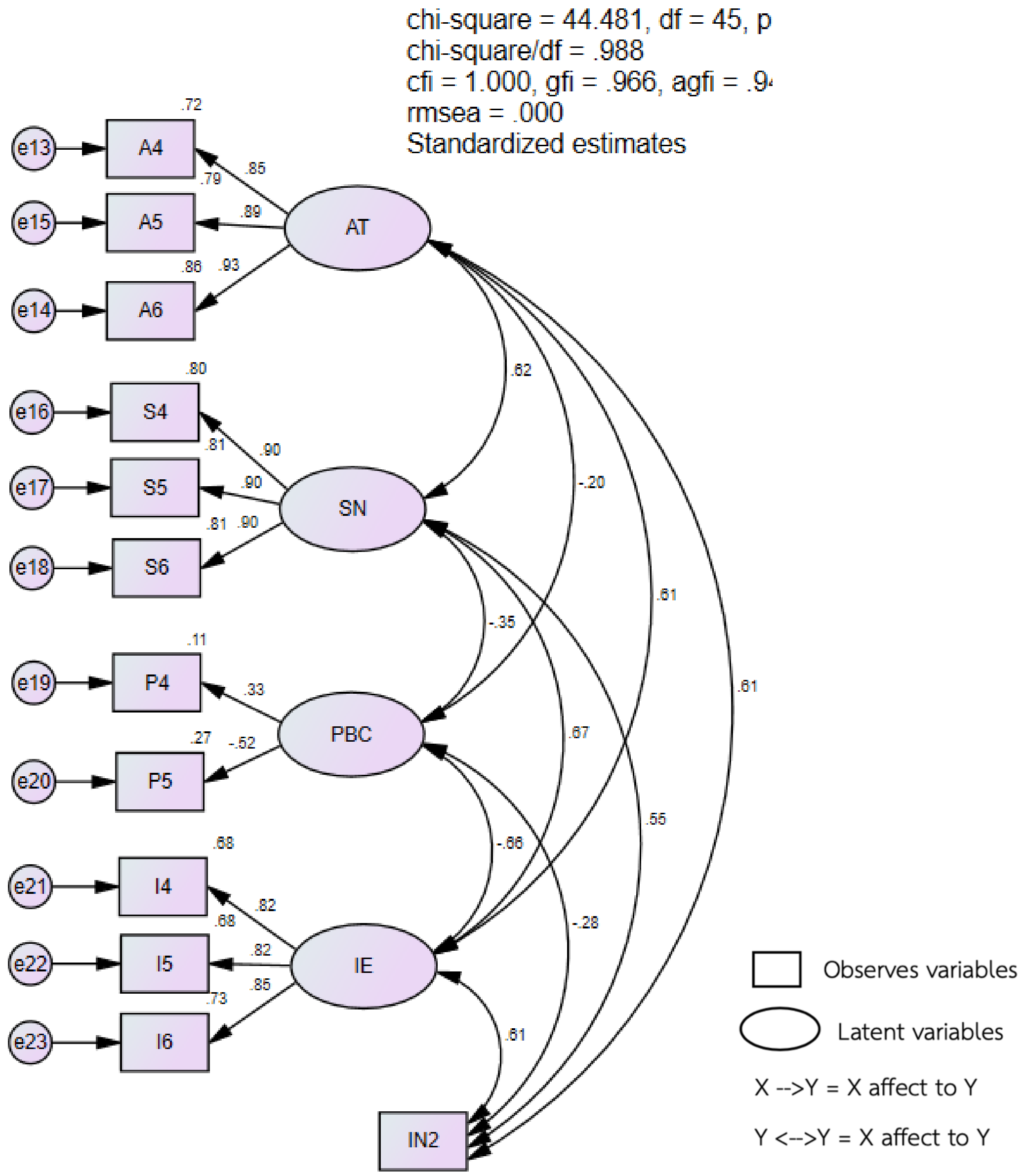


Figure 5.8 CFA result for model II: One-time water conservation behaviors (Standardized Coefficient)

Note AT: Attitude SN: Social norm PBC: Perceived behavioral control IE: Information effect IN: Intention

Overall, these results of Model I and II confirm that the items can represent the latent variables and the theoretical framework model can be applied for the structural equation model (SEM).

5.6 Structural equation model

Structural equation model (SEM) comprises measurement and structural model in one analysis. The measurement model has been tested with CFA which is a basic framework for theoretical model analysis by measuring a reliability and validity values. This CFA also concentrates on the factor loadings, correlation, and covariances between the observed items. With SEM, it investigates the connection between the latent variables and focuses on the relationship of independent and dependent variables. And, the objective of SEM is to investigate the structural relationship between latent variables and test the hypothesized theoretical model.

This research includes two hypothesized theoretical models as shown in Figure 5.9 - 5.10. To evaluating SEM, the software AMOS was applied, and the maximum likelihood method was a used technique to estimate the parameters in the models. The measurement of structural model fit involves λ^2 (Chi-square), λ^2/df (Chi-square/degree of freedom), CFI (comparative fit index), GFI (goodness of fit), AGFI (adjusted goodness of fit), and RMSEA (root-mean-square error of approximation), which the results have been presented in Table 5.15 -5.16.

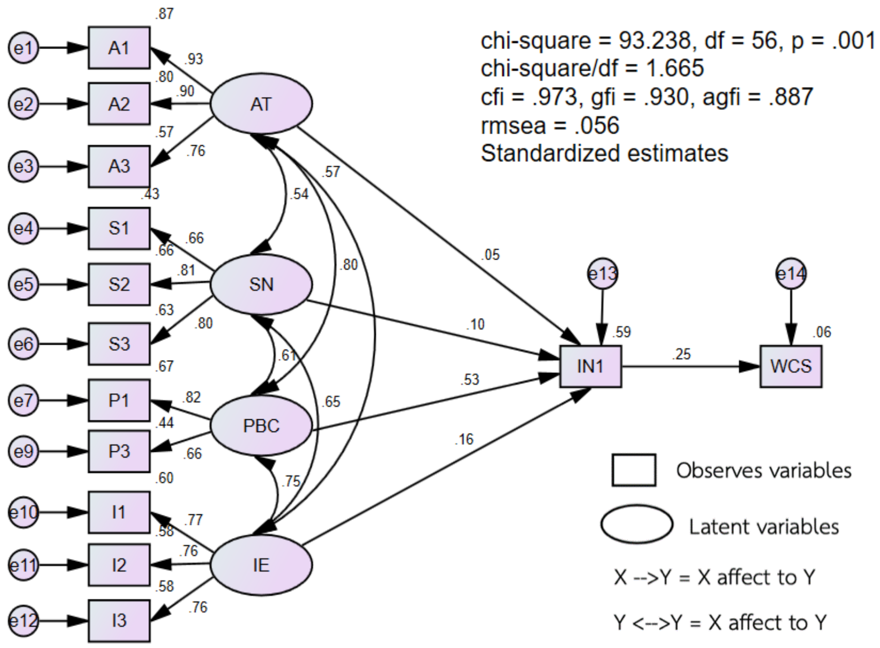


Figure 5.9 SEM result for model I: Everyday conservation behaviors (Standardized Coefficient)

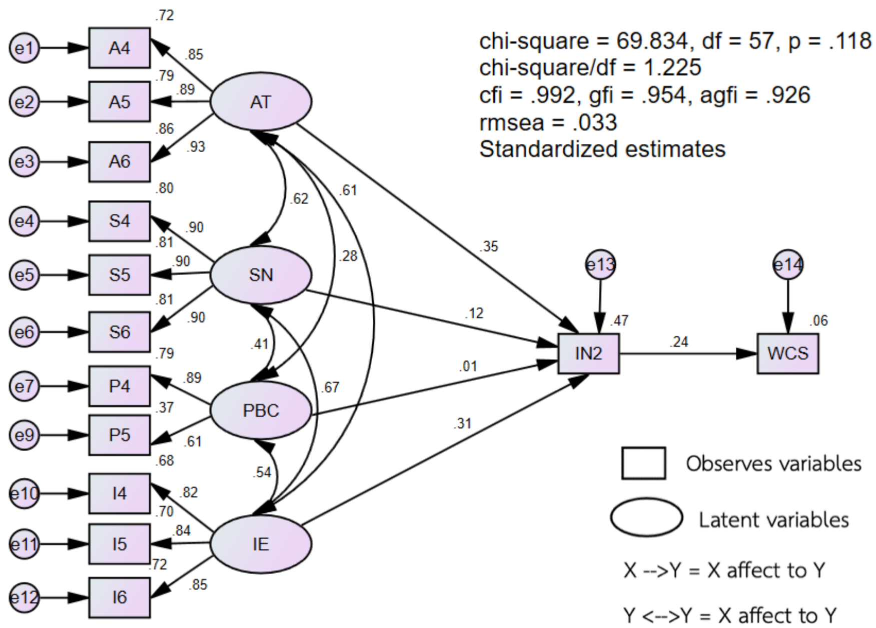


Figure 5.10 SEM result for model II: One-time water conservation behaviors (Standardized Coefficient)

Note AT: Attitude SN: Social norm PBC: Perceived behavioral control IE: Information effect

IN: Intention WCS: Water conservation behavior

Results and Discussion of SEM for model I and II

The parameters of model fit are reported in Table 5.15 -5.16. For model I, most of the parameter has been accepted, excepting the λ^2 (Chi-square), p-value is less than 0.05. The hypothesized model is rejected, however, when concerning other parameters, the model result is good model fit. Next, model II, all of the parameters have been approved as good level.

Table 5.15 SEM model fitness result for model I

Model fit criteria	Recommended acceptable levels	Model I value	Comment
λ^2 (Chi-square)	Insignificant p-value [a]	93.238 (p= 0.001)	The model is rejected
λ^2/df	<2 [a]	1.665	Good model fit
CFI	> 0.97 [a]	0.973	Good model fit
GFI	> 0.90 [b]	0.930	Good model fit
AGFI	> 0.80 [b]	0.887	Good model fit
RMSEA	<=0.08 [a]	0.056	Acceptable model fit

a This recommendation for N (number of observations group) < 250 and m (number of observed variables) <=12 (Hair et al., 2015) b Byrne (2001)

Table 5.16 SEM model fitness result for model II

Model fit criteria	Recommended acceptable levels	Model II value	Comment
λ^2 (Chi-square)	Insignificant p-value [a]	69.834 (p= 0.118)	The model is accepted
λ^2/df	<2 [c]	1.225	Good model fit
CFI	> 0.97 [a]	0.992	Good model fit
GFI	> 0.90 [b]	0.954	Good model fit
AGFI	> 0.80 [b]	0.926	Good model fit
RMSEA	<=0.08 [a]	0.033	Good model fit

a This recommendation for N (number of observations group) < 250 and m (number of observed variables) <=12 (Hair et al, 2015) b Byrne, 2001

After indicating of model fitness, an examination of latent variables must be defined. Table 5.17 and 5.18 surmise the standardized coefficient of each latent variables.

<u>*Model I: Everyday water conservation behaviors*</u>

As we can see from Table 5.17, only the PBC is significantly influence to the intention of everyday water conservation behaviors ($p<0.05$), nevertheless, other factors are not significant. Moreover, the square multiple correlation (R^2) for the intention of everyday water conservation behaviors is relatively high 0.59. It means that 59% of the variability of four latent constructs account for the intention of everyday water conservation behaviors.

Table 5.17 Standardized and unstandardized coefficient for model I (*p<0.05, **p<0.01, ***p<0.001)

Relationship			Unstandardized	Standardized	P
IN1	<---	AT	0.058	0.046	0.737
IN1	<---	SN	0.164	0.103	0.224
IN1	<---	PBC	0.731	0.532	0.014*
IN1	<---	IE	0.217	0.159	0.217
WCS	<---	IN1	1.187	0.251	***

Furthermore, the model I includes the water conservation behaviors (WSC) that can be predicted by the intention. As the result, the path coefficient is significant ($p < 0.001$), however, the square multiple correlation (R^2) is very low, only 6%. It can be implied that this intention has small effect to the behaviors, so other factors must be included in the model for future investigation.

In addition, this result support the finding of Perren and Yang (2015) who confirmed that PBC significantly predicted the intention. This finding contributes to the behavioral intervention which is targeting to facilitate water curtailment behaviors and remove obstacles. The practical information and guidance related to water efficiency/usage in household might be provided in order to change people's perception. Moreover, Clark and Finley (2007) who examined the determinants of water conservation intention in Blagoevgrad, Bulgaria reported that PBC showed positive and significant correlation with the intention. They also suggest increasing PBC in water users by sharing instruction and guideline for water saving practices. Comparing with Pro-environmental behaviors (PEB), PBC had strong impact on the intention to perform PEB in the workplace (Blok et al., 2014).

Regarding the average score of the affecting factors on the water conservation behaviors in Table 5.4, the result of PBC is inconsistent. The highest score of the affecting factors is attitude factor, but the SEM result is PBC that is significant.

Model II: One-time water conservation behaviors

Table 5.18 shows that two latent variables (attitude and information effect) significantly influence on the intention to install water saving products, with $p<0.001$ for attitude and $p<0.05$ for information effect. Whereas water conservation behaviors can be significantly predicted by the intention ($p<0.01$). This intention has a negative effect on the behavior. Comparing between the significant variables, attitude and information effect has a similar degree of direct effect to the intention, 0.346 and 0.306, respectively.

Table 5.18 Standardized and unstandardized coefficient for model II (*p<0.05, **p<0.01, ***p<0.001)

Relationship			Unstandardized	Standardized	P
IN2	<---	AT	0.445	0.346	***
IN2	<---	SN	0.125	0.120	0.154
IN2	<---	PBC	0.015	0.014	0.853
IN2	<---	IE	0.388	0.307	0.002*
WCS	<---	PBC	1.111	0.239	***

The square multiple correlation (R^2) for the intention of everyday water conservation behaviors is 0.47 which this model account for 47% of the variance in intention to install water saving devices. This suggest that the model II alone is inadequate to predict the intention to install water saving appliances in the condominium. there are additional factors that may explain this intention.

In addition, this result of attitude effect supports the finding of Lam (2006) who studied the predicting intention to install dual-flash controller at home. The author found the significant association between attitude and respondent's intention. Moreover, Kaiser and Fuhrer (2003) suggested that environmental knowledge influences on attitude which is a mediation effect of the behaviors. In other word, people need to supportive knowledge to form the positive attitude, then this attitude can responsible for the intention of environmental-friendly behaviors.

The effect of information is significant. This result is in keeping with the study of Trumbo and O'Keefe (2005) who represented intention and behaviors of water conservation using the theory of reasoned action including extra influential factors. The research found that information effects related to seeking, exposure, and attention for water conservation was significantly direct effect to intention and behavior. The authors also suggested that information or knowledge is a main factor for individuals to adapt their lifestyle for conserving water,

Turning to consider the average score of the affecting factors on the water conservation behaviors in Table 5.4, the result of SEM (attitude) is according with the score presenting the highest affecting factor score is attitude. This previous result would seem to suggest that the attitude is likely to predict the intention to install the water saving appliances in household. With respect to these affecting factors, knowledge providing regarding to water saving is necessary condition to bring about the intention to save water.

CHAPTER 6

CONCLUSION

This research highlights the need for understanding how people in condominium perform water use and water conservation practices and indicating impacting factor to the intention of water conservation behaviors. It can be stated that these findings have provided compelling evidence of practical implementation on water demand side management applying the Theory of planned behaviors. The objectives of these thesis are as followed;

- To examine and analyze water use and water conservation behaviors in condominiums
- To identify influential factors to water conservation behaviors in condominiums

The theory of planned behavior (TPB) was applied as the model framework to identify the influential factor to intention and behaviors related water conservation practices. The questionnaire survey had been developed for data collection which was complete by 210 condominium residents in Bangkok. Next, the statistically analysis had performed using (1) descriptive statistic to define respondent’s characteristic (2) ANOVA to determine effects of sociodemographic to the water conservation behaviors (3) Structural equation model (SEM) to verify significant influencing factors to the intention based on TPB.

The conclusion is divided in two sections referred to the objectives and the recommendation for further study is also discussed.

6.1 Situations and practices on water use and water conservation behaviors

Most of the respondents were female, were 31-40 years old, had accomplished higher bachelor's degree. As household projection of Thai population in 2010-2020 study, it found that women tend to be the household leader of Thai family which was consistent with the respondents' data. Most of them had a personal income per month over 40,000 Thai baht and worked in private company. As claimed by National Statistical Office, in 2016, average income per household in Bangkok was approximately 41,897 Baht which is compatible with the collecting data. And, most of them were reported as the owner of room unit in condominiums, as this ownership, decision of behaviors changes related to water conservation will be possible.

The findings show the two highest practices rate related to everyday water conservation behaviors as follow; making sure that the tap not drip and cleaning food scrapes before dish washing. It can be stated that these two main behaviors are involved in habit or repeatable behaviors. Moreover, most of condominium residents have widely installed dual-flush toilet but have not generally had water saving urinal. And around 30% of respondents had aerated faucet and aerated shower. As the result, installation of water saving equipment have limited in condominium, the rooms' owners had no option to install the water saving devices unless they pay for a renovation.

6.2 Influential factors to water conservation behaviors in condominiums

<u>Socio-demographic</u>

The findings confirm that age, education level, income, and occupation have significant impact on the behaviors. The older people and other occupation group (excluding government officer, business owner, employee, and student) were more likely to engage in water conservation behaviors. Comparing to other researches (Clark and Finley (2007); Lam (2006); Wolters (2014)), the correlation is not consistent, it depends on the characteristics of samples and other affecting factors. Thus, with the inconsistency, the sociodemographic factors are not strongly influence the behaviors. Other factors as well as psychosocial factors are supposedly concerned.

Psychosocial factors

As per the Theory of planned behavior (TPB), attitude toward behavior, social norm, perceived behavioral control, and information effect (additional factor) have been included into the model framework.

The condominium residents had very positive attitude, social norm, perceived behavioral control, and information effect on two targeted behaviors; (1) every day and (2) one-time water conservation behaviors, the highest score regarding to Psychosocial factors was on attitude factor. This study highlights the favorable feeling to the behavior, it relates to behavioral belief. Consequently, the respondents have potential to perform water conservation behavior. With highly positive agreement on water conservation behavior, however, it is not always translated into performing of water saving behaviors. So, the SEM need to apply for further analysis.

The intention of everyday water conservation behaviors

Regarding to the intention of everyday water conservation behaviors, perceived behavioral control (PBC) is a significant affecting factor to this behavior. This affecting factor refers to a perception of ease or difficulty to perform the behavior. Considering to water saving behavior, provide water conservation program and common practices to the public that confirm that people find it very easy to perform the water conservation behaviors. Procedural information is concerned with possible options to perform the behaviors or practical methods to conduct the target behaviors (Kaiser & Fuhrer, 2003). Moreover, technological or innovative devices relating to sanitary appliances must be support in order to make life easier and lead to change behaviors. Further research about the innovation regarding to water saving should be more explored.

The intention of one-time water conservation behaviors

Furthermore, the intention of water saving device installation has significant influence by attitude and information effect. This attitude refers to positive or negative evaluation of the behaviors. This finding could provide practical implication, particular in the field of education tool engaging the public on water conservation. The educational tool involves in raising public awareness and inform water conservation knowledge to the public and community. However, to evaluate the output of the awareness campaign takes time to measure, developing the intervention methods on promoting water saving in household need to be considered (Inman and Jeffrey (2006); Benzoni and Telenko (2016)).

In addition, information effect which consist of seeking, exposure, and attention has significant effect to the intention. As a consequence, the convincing and powerful information should be communicated in order to motivate to install water saving devices. As claimed by Kaiser and Fuhrer (2003), ecological behavior (Pro-environmental behaviors) can be affected by three forms of knowledge including declarative knowledge (facts or theories), procedural knowledge (methods and actions), and effectiveness knowledge (consequences). With respect to this effect, the fact of water saving devices including the equipment standard, device specification, price as declarative knowledge, manual of device installation as procedural knowledge, and the amount of water saving that can transfer to amount of money saving as effectiveness knowledge should be inform to water users.

Summary

Consequently, the results of this study not only address the significant effects to the targeted behaviors, but also provide several issues of policy makers about water demand-side management plan. The right perception of water saving knowledge must be promoted to bring about the action of water conservation. And, the strategy or tactic related to profound consequences of performing water saving action should be widely publicized in order to influence people behaviors (De Young, 2000). It is suggested that the communication actions encouraging and promoting water conservation behaviors should be considered for building the intention and ultimately changing the behaviors. The massage must be effective and powerful by eliminating all of obstacles or barriers to performing the behaviors and offer opportunities, resources, information to do the action.

6.3 Recommendations for future research

This current research provides insight about the influential factors to the behaviors only in condominiums sector, some other sectors such as different type of household need to be investigated in further study. The commercial sectors such as department store, hotel, hostel that consume a lot of water use requires more examination. In addition, the future study should seek to measure the actual water use behaviors in household to compare with the intention according to the extension TPB model. The intervention program based on the psychosocial factors can be proposed, so that the actually behavioral change for fostering water conservation behaviors can be measured.

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APPENDIX I

QUESTIONNAIRE SURVEY

CHULA ΣNGINEERING
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<u>แบบสอบถาม</u>

"การศึกษาปัจจัยที่มีผลต่อพฤติกรรมประหยัดน้ำของผู้ที่อาศัยอยู่ในคอนโดมิเนียม พื้นที่กรุงเทพมหานคร"

ภาควิชาวิศวกรรมสิ่งแวดล้อม คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

คำชี้แจงสำหรับผู้ตอบแบบสอบถาม

1. แบบสอบถามนี้เป็นส่วนหนึ่งของวิทยานิพนธ์ ในระดับปริญญามหาบัณฑิต ภาควิชาวิศวกรรมสิ่งแวดล้อม คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย โดยมีวัตถุประสงค์เพื่อรวบรวมข้อมูลพื้นฐานในการพัฒนามาตรการประหยัดน้ำให้มีประสิทธิภาพมากขึ้นและนำไปใช้ได้จริงสำหรับผู้อยู่อาศัยในคอนโดมิเนียม
2. ข้อมูลของท่านจะถูกนำไปใช้เพื่อการศึกษาและเป็นประโยชน์ทางการวิชาการแก่การศึกษาพฤติกรรมประหยัดน้ำในคอนโดมิเนียม <u>ขอความอนุเคราะห์ในการตอบแบบสอบถามอย่างถูกต้องและตรงกับความจริงมากที่สุด</u>
3. หากมีข้อสงสัย โปรดติดต่อ นางสาวสุธิดา ศิริมังคละ 089-781-9060 หรือ รศ.ดร.ชนาธิป ผาริโน ภาควิชาวิศวกรรมสิ่งแวดล้อม คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย 02-218-6668
4. แบบสอบถามนี้ ประกอบด้วย 3 ส่วน (จำนวน 6 หน้า)

    ส่วนที่ 1 ข้อมูลพื้นฐานผู้ตอบแบบสอบถาม

    ส่วนที่ 2 พฤติกรรมการใช้น้ำและการประหยัดน้ำ

    ส่วนที่ 3 ความคิดเห็นของผู้ตอบแบบสอบถามต่อพฤติกรรมการประหยัดน้ำ

    3.1 ความคิดเห็นต่อการประหยัดน้ำที่ทำเป็นประจำ

    3.2 ความคิดเห็นต่อการติดตั้งสุขภัณฑ์ประหยัดน้ำ

**ขอขอบพระคุณท่านเป็นอย่างสูงที่ท่านกรุณาให้ความร่วมมือ
ในการตอบแบบสอบถามนี้**

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ส่วนที่ 1 ข้อมูลพื้นฐานผู้ตอบแบบสอบถาม

(กรุณาทำเครื่องหมาย √ ณ ตัวเลือกที่ตรงกับความเห็นและตามคำตอบลงในช่องว่าง)

1. เพศ ☐ชาย ☐หญิง
2. อายุ ☐20ปี หรือต่ำกว่า ☐21-30 ปี ☐31-40 ปี ☐41-50 ปี ☐51-60 ปี ☐มากกว่า 60 ปี
3. ประวัติการศึกษา ☐ต่ำกว่ามัธยมศึกษาปีที่ 6 ☐มัธยมศึกษาปีที่ 6หรือเทียบเท่า ☐ปริญญาตรีหรือเทียบเท่า ☐ปริญญาตรีขึ้นไป
4. รายได้ต่อเดือน ☐ต่ำกว่า 10,000 บาท ☐ 10,000-25,000 บาท ☐ 25,000-40,000 บาท ☐ 40,000 บาทขึ้นไป
5. อาชีพ ☐ รับราชการ/รัฐวิสาหกิจ ☐ ค้าขาย/ธุรกิจส่วนตัว ☐ ลูกจ้างเอกชน/พนักงานบริษัท ☐ นักเรียน/นักศึกษา ☐ อื่นๆ(โปรดระบุ)..
6. ความเป็นเจ้าบ้าน ☐ เป็นเจ้าของบ้าน ☐ เป็นผู้อาศัย ☐ เป็นผู้เช่าอาศัย
7. จำนวนสมาชิกภายในครัวเรือน
   ☐วัยทารกและเด็กเล็ก(อายุแรกเกิด ถึง 5 ปี) ....คน
   ☐วัยเด็กโต (อายุ 5-11 ปี) ....คน
   ☐วัยรุ่น (อายุ 12-20 ปี) ....คน
   ☐วัยผู้ใหญ่ (อายุ 20-60 ปี) ....คน
   ☐วัยสูงอายุ (อายุ 60 ปีขึ้นไป) ....คน
8. ชื่อคอนโดมิเนียมที่ท่านอาศัยอยู่...
9. คอนโดมิเนียมของท่านอยู่เขตใดในกรุงเทพมหานคร...

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ส่วนที่ 2 พฤติกรรมการใช้น้ำและการประหยัดน้ำ

(กรุณาทำเครื่องหมาย √ ณ ตัวเลือกที่ตรงกับความเห็นและตามคำตอบลงในช่องว่าง)

1. ปัจจุบันค่าใช้จ่ายสำหรับค่าน้ำประปาในครัวเรือนของคุณเฉลี่ยประมาณเท่าไหร่..............................บาท/เดือน
2. ปัจจุบันคุณใช้เวลาในการอยู่อาศัยภายในคอนโดมิเนียมแห่งนี้กี่วันต่อสัปดาห์.........................วัน/สัปดาห์
3. คุณทำอาหารรับประทานเองภายในคอนโดมิเนียมของคุณหรือไม่ ☐ ใช่..........วัน/สัปดาห์ ☐ ไม่ใช่
4. คุณซักผ้าเองภายในคอนโดมิเนียมของคุณใช่หรือไม่ ☐ ใช่ ☐ ไม่ใช่
5. จากข้อ 3 ถ้าใช่ คุณใช้วิธีใดในการซักผ้า ☐ ซักมือ ☐ เครื่องซักผ้า
6. คุณมีพฤติกรรมการใช้น้ำและการประหยัดน้ำดังต่อไปนี้หรือไม่ (กรุณาทำเครื่องหมาย √ ณ ตัวเลือกที่ตรงกับความจริงมากที่สุด)

พฤติกรรมการใช้น้ำและการประหยัดน้ำ	**ประจำ** (100%)	**บ่อยครั้ง** (80%)	**บางครั้ง** (60%)	**นานๆ ครั้ง** (40%)	**แทบจะไม่เคย** (20%)	**ไม่เคย** (0%)
1.นำเศษอาหารออกทุกครั้งก่อนล้างจาน						
2.เปิดน้ำไหลตลอดเวลา ขณะล้างจาน						
3.เปิดน้ำฝักบัวตลอดเวลา ขณะถูสบู่						
4.เปิดน้ำไหลตลอดเวลา ขณะแปรงฟัน						
5.ปิดก๊อกน้ำสนิททุกครั้งหลังเลิกใช้งาน						
6.รวบรวมเสื้อผ้าให้มีปริมาณมากพอก่อนที่จะซักเครื่อง						
7.ตรวจสอบอุปกรณ์ใช้น้ำเป็นประจำว่ามีการรั่วซึมหรือไม่						
8.เปลี่ยนสุขภัณฑ์ทันทีเมื่อพบว่ามีการชำรุด						

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7. คุณมีการใช้อุปกรณ์ประหยัดน้ำภายในบ้านของคุณหรือไม่

(กรุณาทำเครื่องหมาย √ ณ ตัวเลือกที่ตรงกับความเห็นของท่านมากที่สุด)

การใช้อุปกรณ์ประหยัดน้ำ	**ใช้**สุขภัณฑ์ประหยัดน้ำ	**ไม่ใช้**สุขภัณฑ์ประหยัดน้ำ	**ไม่แน่ใจ**ว่าเป็นสุขภัณฑ์ประหยัดน้ำลักษณะเดียวกัน	**ไม่มี**สุขภัณฑ์หรืออุปกรณ์ชนิดนี้
1.โถสุขภัณฑ์ระบบคู่ (2 ปุ่มกด) เลือกชำระ แบบเบาหรือแบบหนัก (ปล่อยน้ำออก ไม่เกินครั้งละ 4.5/3ลิตร)				
2.โถสุขภัณฑ์ระบบเดี่ยว (ปล่อยน้ำออกไม่เกิน ครั้งละ 4.8 ลิตร)				
3.ก๊อกน้ำรุ่นประหยัดน้ำ แบบมีตะแกรงกรองน้ำ เพื่อผสมอากาศกับน้ำ / ติดตั้งวาล์วผสมน้ำกับอากาศ				
4.ฝักบัว รุ่นประหยัดน้ำแบบตะแกรง กรองน้ำ เพื่อผสมอากาศกับน้ำ				
5.ฝักบัวแบบปรับความดันน้ำที่ต้องการได้				
6.โถปัสสาวะชายรุ่นประหยัดน้ำ				
7.เครื่องซักผ้า รุ่นประหยัดน้ำ				

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ส่วนที่ 3.1 ความคิดเห็นต่อการประหยัดน้ำที่ทำเป็นประจำ (กรุณาทำเครื่องหมาย √ ณ ตัวเลือกที่ตรงกับความเห็นของท่านมากที่สุด)

ข้อความ	ระดับความคิดเห็น						
	มากที่สุด (3)	มาก (2)	ค่อนข้างมาก (1)	เฉย ๆ (0)	ค่อนข้างน้อย (-1)	น้อย (-2)	น้อยที่สุด (-3)
1.ทัศนคติต่อการประหยัดน้ำที่ทำเป็นประจำ							
การประหยัดน้ำเป็นสิ่งที่สำคัญและจำเป็น							
การประหยัดน้ำเป็นความรับผิดชอบของฉัน							
การประหยัดน้ำสามารถลดผลกระทบจากสภาวะภัยแล้งได้							
2.การคล้อยตามกลุ่มอ้างอิงที่มีผลต่อการประหยัดน้ำที่ทำเป็นประจำ							
พ่อแม่ของฉันคิดว่าการประหยัดน้ำเป็นสิ่งสำคัญ							
เพื่อนของฉันคิดว่าฉันควรประหยัดน้ำ							
คนที่มีความสำคัญต่อฉัน (ครอบครัว เพื่อน คนใกล้ชิด) มีส่วนทำให้ฉันประหยัดน้ำ							
3.การรับรู้ถึงปัจจัยที่มีผลต่อการประหยัดน้ำที่ทำเป็นประจำ							
ฉันคิดว่าการประหยัดน้ำในคอนโดมิเนียมเป็นเรื่องง่าย							
ฉันคิดว่าการประหยัดน้ำเป็นเรื่องเสียเวลา							
ฉันรู้วิธีการประหยัดน้ำ							
4.การรับรู้ข้อมูลเกี่ยวกับการประหยัดน้ำที่ทำเป็นประจำ							
ฉันมีความพยายามในการหาข้อมูลเกี่ยวกับการประหยัดน้ำ							
ฉันได้รับข้อมูลเกี่ยวกับการประหยัดน้ำ จากสื่อต่าง ๆ ดังนี้ โทรทัศน์ อินเตอร์เน็ต หนังสือพิมพ์ วิทยุ เพื่อนและครอบครัว และอื่น ๆ							
ฉันมีความสนใจ เมื่อฉันได้รับข้อมูลเกี่ยวกับการประหยัดน้ำ							
5.ความตั้งใจที่จะประหยัดน้ำ							
ฉันมีความตั้งใจที่จะประหยัดน้ำในอีกหกเดือนข้างหน้า							

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ส่วนที่ 3.2 ความคิดเห็นต่อการติดตั้งสุขภัณฑ์ประหยัดน้ำ (กรุณาทำเครื่องหมาย √ ณ ตัวเลือกที่ตรงกับความเห็นของท่านมากที่สุด)

ข้อความ	ระดับความคิดเห็น						
	มากที่สุด (3)	มาก (2)	ค่อนข้างมาก (1)	เฉย ๆ (0)	ค่อนข้างน้อย (-1)	น้อย (-2)	น้อยที่สุด (-3)
1.ทัศนคติต่อการติดตั้งสุขภัณฑ์ประหยัดน้ำ							
การใช้สุขภัณฑ์ประหยัดน้ำสามารถช่วยลดการใช้น้ำได้							
สุขภัณฑ์ประหยัดน้ำเป็นสิ่งจำเป็น							
การติดตั้งสุขภัณฑ์ประหยัดน้ำเป็นประโยชน์ต่อฉัน							
2.การคล้อยตามกลุ่มอ้างอิงที่มีผลต่อการติดตั้งสุขภัณฑ์ประหยัดน้ำ							
พ่อและแม่ของฉันคิดว่าฉันควรติดตั้งสุขภัณฑ์ประหยัดน้ำ							
เพื่อนของฉันคิดว่าการใช้สุขภัณฑ์ประหยัดน้ำเป็นสิ่งที่ดี							
คนรอบข้างฉัน (ครอบครัว เพื่อน คนใกล้ชิด) มีส่วนในการเลือกใช้สุขภัณฑ์ประหยัดน้ำของฉัน							
3.การรับรู้ถึงปัจจัยที่มีผลต่อการติดตั้งสุขภัณฑ์ประหยัดน้ำ							
ฉันคิดว่าอุปกรณ์และสุขภัณฑ์ประหยัดน้ำมีราคาแพงกว่าอุปกรณ์ปกติ							
ฉันคิดว่าการติดตั้งอุปกรณ์ประหยัดน้ำในคอนโดมิเนียมของฉันเป็นเรื่องยากและซับซ้อน							
ฉันรู้วิธีการติดตั้งสุขภัณฑ์ประหยัดน้ำหรือปรับปรุงสุขภัณฑ์ให้ใช้น้ำน้อยลงภายในคอนโดมิเนียมของฉัน							
4.การรับรู้ข้อมูลเกี่ยวกับการติดตั้งสุขภัณฑ์ประหยัดน้ำ							
ฉันมีความพยายามในการหาข้อมูลเกี่ยวกับสุขภัณฑ์ประหยัดน้ำ							
ฉันได้รับข้อมูลเกี่ยวกับสุขภัณฑ์ประหยัดน้ำ จากสื่อต่างๆดังนี้ โทรทัศน์ อินเตอร์เน็ต หนังสือพิมพ์ วิทยุ เพื่อนและครอบครัว และอื่นๆ							
ฉันมีความสนใจเมื่อฉันได้รับข้อมูลเกี่ยวกับสุขภัณฑ์ประหยัดน้ำ							
5.ความตั้งใจในการติดตั้งสุขภัณฑ์ประหยัดน้ำ							
ถ้าฉันมีโอกาสเปลี่ยนสุขภัณฑ์ในคอนโดมิเนียมฉันจะเลือกใช้สุขภัณฑ์ประหยัดน้ำ							

ข้อเสนอแนะ

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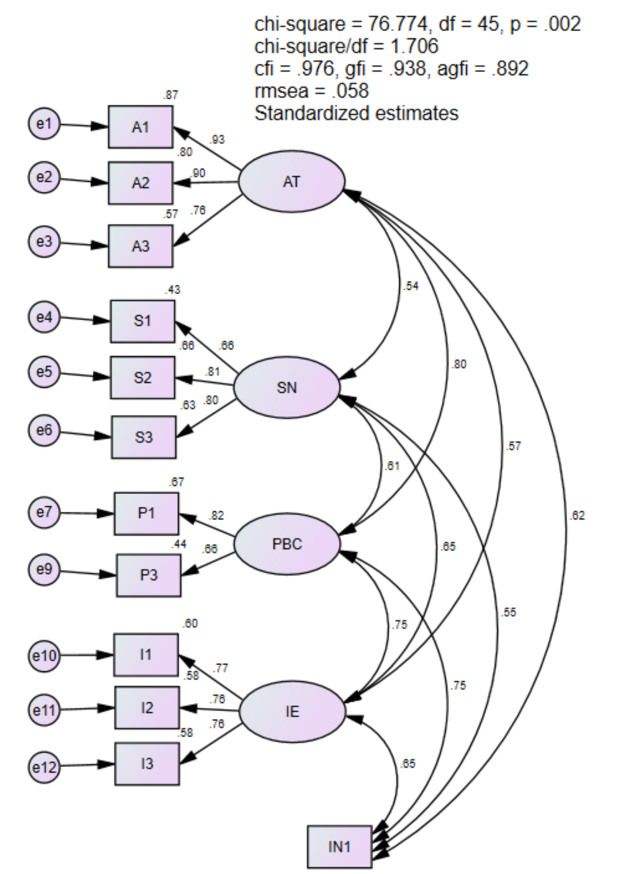
APPENDIX II

RESULTS OF CONFIRMATORY FACTOR ANALYSIS

Model I



Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 78

Number of distinct parameters to be estimated: 33

Degrees of freedom (78 - 33): 45

Result (Default model)

Minimum was achieved

Chi-square = 76.774

Degrees of freedom = 45

Probability level = .002

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
A1	<---	AT	1.000				
A2	<---	AT	.937	.048	19.525	***	par_1
A3	<---	AT	.858	.061	14.142	***	par_2
S1	<---	SN	1.000				
S2	<---	SN	1.298	.142	9.140	***	par_3
S3	<---	SN	1.338	.148	9.059	***	par_4
P1	<---	PBC	1.000				
P3	<---	PBC	.810	.085	9.505	***	par_5
I1	<---	IE	1.000				
I2	<---	IE	1.001	.096	10.460	***	par_6
I3	<---	IE	1.007	.097	10.418	***	par_7

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
A1	<---	AT	.933
A2	<---	AT	.896
A3	<---	AT	.756
S1	<---	SN	.659
S2	<---	SN	.812
S3	<---	SN	.795
P1	<---	PBC	.820
P3	<---	PBC	.660
I1	<---	IE	.774
I2	<---	IE	.762
I3	<---	IE	.759

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
AT	<-->	SN	.332	.061	5.435	***	par_8
SN	<-->	PBC	.345	.063	5.431	***	par_9
PBC	<-->	IE	.494	.074	6.637	***	par_10
SN	<-->	IE	.368	.065	5.612	***	par_11
AT	<-->	PBC	.571	.074	7.676	***	par_12
AT	<-->	IE	.409	.068	6.019	***	par_13
AT	<-->	IN1	.605	.083	7.299	***	par_14
SN	<-->	IN1	.431	.076	5.708	***	par_15
PBC	<-->	IN1	.677	.089	7.642	***	par_16
IE	<-->	IN1	.588	.086	6.803	***	par_17

Correlations: (Group number 1 - Default model)

			Estimate
AT	<-->	SN	.539
SN	<-->	PBC	.608
PBC	<-->	IE	.750
SN	<-->	IE	.647
AT	<-->	PBC	.801
AT	<-->	IE	.572
AT	<-->	IN1	.618
SN	<-->	IN1	.554
PBC	<-->	IN1	.750
IE	<-->	IN1	.650

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
AT	.773	.089	8.670	***	par_18
SN	.490	.099	4.942	***	par_19
PBC	.657	.103	6.394	***	par_20
IE	.660	.107	6.158	***	par_21
IN1	1.239	.121	10.223	***	par_22
e1	.115	.026	4.477	***	par_23
e2	.166	.026	6.336	***	par_24
e3	.427	.047	9.141	***	par_25
e4	.639	.074	8.656	***	par_26
e5	.425	.070	6.089	***	par_27
e6	.510	.078	6.528	***	par_28
e7	.320	.058	5.504	***	par_29
e9	.557	.063	8.805	***	par_30
e10	.440	.060	7.332	***	par_31
e11	.477	.063	7.557	***	par_32
e12	.494	.065	7.615	***	par_33

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
I3	.575
I2	.581
I1	.600
P3	.436
P1	.672
S3	.632
S2	.660
S1	.434
A3	.571
A2	.803

	Estimate
A1	.871

Matrices (Group number 1 - Default model)

Implied Covariances (Group number 1 - Default model)

	IN1	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
IN1	1.239											
I3	.592	1.164										
I2	.588	.665	1.138									
I1	.588	.665	.660	1.100								
P3	.548	.403	.400	.400	.987							
P1	.677	.497	.494	.494	.532	.977						
S3	.577	.495	.492	.492	.373	.461	1.386					
S2	.560	.481	.478	.477	.362	.447	.851	1.251				
S1	.431	.370	.368	.368	.279	.345	.655	.636	1.129			
A3	.519	.353	.351	.351	.396	.490	.381	.369	.284	.995		
A2	.567	.386	.383	.383	.433	.535	.416	.404	.311	.621	.846	
A1	.605	.412	.409	.409	.462	.571	.444	.431	.332	.663	.725	.888

Implied Correlations (Group number 1 - Default model)

	IN1	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
IN1	1.000											
I3	.493	1.000										
I2	.496	.578	1.000									
I1	.504	.587	.590	1.000								
P3	.495	.376	.377	.383	1.000							
P1	.615	.466	.468	.476	.542	1.000						
S3	.440	.390	.392	.398	.319	.396	1.000					
S2	.450	.399	.400	.407	.326	.405	.646	1.000				
S1	.365	.323	.325	.330	.264	.328	.524	.535	1.000			
A3	.467	.328	.330	.335	.400	.497	.324	.331	.268	1.000		
A2	.554	.389	.391	.397	.474	.589	.384	.393	.318	.677	1.000	
A1	.577	.405	.407	.414	.494	.613	.400	.409	.331	.705	.836	1.000

Factor Score Weights (Group number 1 - Default model)

	IN1	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
IE	.076	.205	.211	.229	.030	.064	.030	.034	.018	.002	.006	.010
PBC	.143	.042	.043	.046	.133	.286	.011	.013	.006	.030	.083	.128
SN	.036	.023	.024	.026	.006	.013	.207	.241	.123	.005	.014	.022
AT	.028	.002	.002	.003	.021	.046	.007	.008	.004	.108	.304	.470

Total Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I3	1.007	.000	.000	.000
I2	1.001	.000	.000	.000
I1	1.000	.000	.000	.000
P3	.000	.810	.000	.000
P1	.000	1.000	.000	.000
S3	.000	.000	1.338	.000
S2	.000	.000	1.298	.000
S1	.000	.000	1.000	.000
A3	.000	.000	.000	.858
A2	.000	.000	.000	.937
A1	.000	.000	.000	1.000

Standardized Total Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I3	.759	.000	.000	.000
I2	.762	.000	.000	.000
I1	.774	.000	.000	.000
P3	.000	.660	.000	.000
P1	.000	.820	.000	.000
S3	.000	.000	.795	.000
S2	.000	.000	.812	.000
S1	.000	.000	.659	.000
A3	.000	.000	.000	.756
A2	.000	.000	.000	.896

	IE	PBC	SN	AT
A1	.000	.000	.000	.933

Direct Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I3	1.007	.000	.000	.000
I2	1.001	.000	.000	.000
I1	1.000	.000	.000	.000
P3	.000	.810	.000	.000
P1	.000	1.000	.000	.000
S3	.000	.000	1.338	.000
S2	.000	.000	1.298	.000
S1	.000	.000	1.000	.000
A3	.000	.000	.000	.858
A2	.000	.000	.000	.937
A1	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I3	.759	.000	.000	.000
I2	.762	.000	.000	.000
I1	.774	.000	.000	.000
P3	.000	.660	.000	.000
P1	.000	.820	.000	.000
S3	.000	.000	.795	.000
S2	.000	.000	.812	.000
S1	.000	.000	.659	.000
A3	.000	.000	.000	.756
A2	.000	.000	.000	.896
A1	.000	.000	.000	.933

Indirect Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I3	.000	.000	.000	.000
I2	.000	.000	.000	.000
I1	.000	.000	.000	.000
P3	.000	.000	.000	.000
P1	.000	.000	.000	.000
S3	.000	.000	.000	.000
S2	.000	.000	.000	.000
S1	.000	.000	.000	.000
A3	.000	.000	.000	.000
A2	.000	.000	.000	.000
A1	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I3	.000	.000	.000	.000
I2	.000	.000	.000	.000
I1	.000	.000	.000	.000
P3	.000	.000	.000	.000
P1	.000	.000	.000	.000
S3	.000	.000	.000	.000
S2	.000	.000	.000	.000
S1	.000	.000	.000	.000
A3	.000	.000	.000	.000
A2	.000	.000	.000	.000
A1	.000	.000	.000	.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	33	76.774	45	.002	1.706
Saturated model	78	.000	0		
Independence model	12	1417.982	66	.000	21.485

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.051	.938	.892	.541
Saturated model	.000	1.000		
Independence model	.461	.296	.168	.251

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.946	.921	.977	.966	.976
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.682	.645	.666
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	31.774	11.387	60.031
Saturated model	.000	.000	.000
Independence model	1351.982	1233.210	1478.148

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.367	.152	.054	.287
Saturated model	.000	.000	.000	.000
Independence model	6.785	6.469	5.901	7.072

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.058	.035	.080	.258
Independence model	.313	.299	.327	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	142.774	147.152	253.229	286.229
Saturated model	156.000	166.347	417.074	495.074
Independence model	1441.982	1443.574	1482.148	1494.148

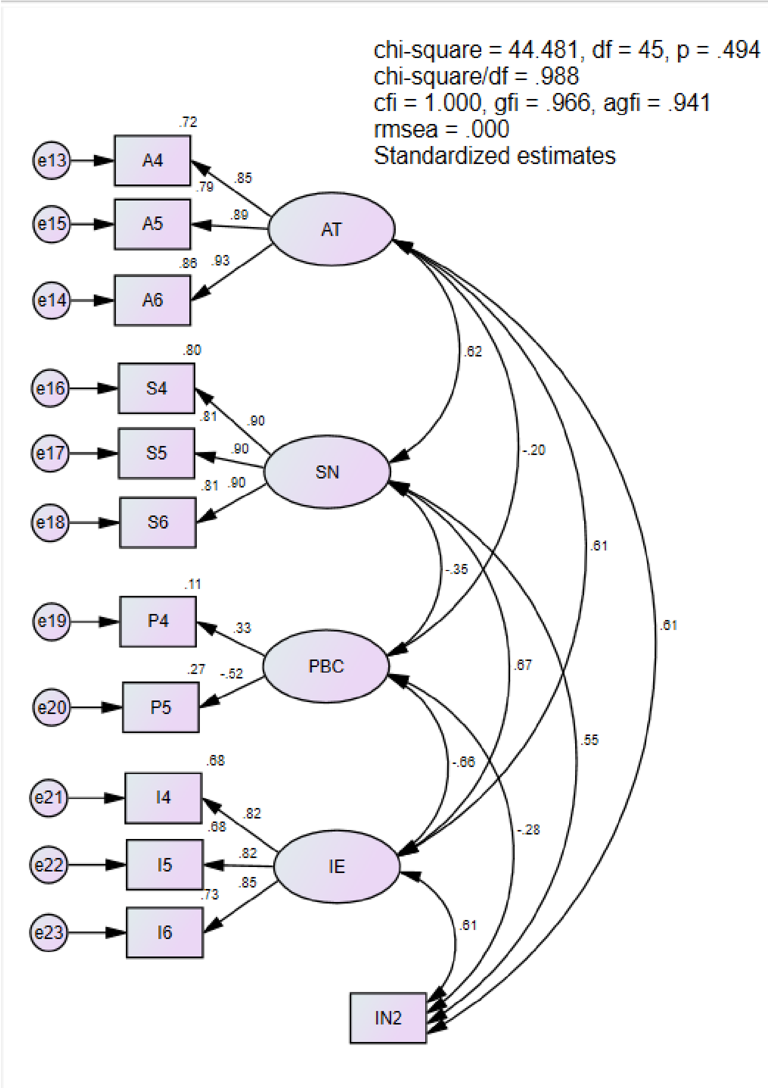
ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.683	.586	.818	.704
Saturated model	.746	.746	.746	.796
Independence model	6.899	6.331	7.503	6.907

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	168	191
Independence model	13	15

Model II



Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	78
Number of distinct parameters to be estimated:	33
Degrees of freedom (78 - 33):	45

Result (Default model)

Minimum was achieved

Chi-square = 44.481

Degrees of freedom = 45

Probability level = .494

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
A4	<---	AT	1.000				
A5	<---	AT	1.109	.066	16.913	***	par_1
A6	<---	AT	1.063	.059	17.945	***	par_2
S4	<---	SN	1.000				
S5	<---	SN	.967	.051	18.966	***	par_3
S6	<---	SN	.969	.051	19.091	***	par_4
P4	<---	PBC	1.000				
P5	<---	PBC	-3.143	1.111	-2.829	.005	par_5
I4	<---	IE	1.000				
I5	<---	IE	.991	.074	13.367	***	par_6
I6	<---	IE	1.016	.073	13.908	***	par_7

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
A4	<---	AT	.851
A5	<---	AT	.890
A6	<---	AT	.928
S4	<---	SN	.895
S5	<---	SN	.897
S6	<---	SN	.901
P4	<---	PBC	.330
P5	<---	PBC	-.518
I4	<---	IE	.824
I5	<---	IE	.825
I6	<---	IE	.853

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
AT	<-->	SN	.546	.081	6.759	***	par_8
SN	<-->	PBC	-.061	.028	-2.193	.028	par_9
PBC	<-->	IE	-.096	.033	-2.950	.003	par_10
SN	<-->	IE	.600	.087	6.929	***	par_11
AT	<-->	PBC	-.029	.020	-1.462	.144	par_12
AT	<-->	IE	.444	.069	6.430	***	par_13
AT	<-->	IN2	.561	.080	7.028	***	par_14
SN	<-->	IN2	.617	.094	6.583	***	par_15
PBC	<-->	IN2	-.051	.026	-1.951	.051	par_16
IE	<-->	IN2	.566	.083	6.802	***	par_17

Correlations: (Group number 1 - Default model)

			Estimate
AT	<-->	SN	.620
SN	<-->	PBC	-.345
PBC	<-->	IE	-.664
SN	<-->	IE	.671
AT	<-->	PBC	-.200
AT	<-->	IE	.612
AT	<-->	IN2	.612
SN	<-->	IN2	.546
PBC	<-->	IN2	-.279
IE	<-->	IN2	.607

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
AT	.714	.095	7.523	***	par_18
SN	1.084	.133	8.168	***	par_19
PBC	.029	.017	1.700	.089	par_20

	Estimate	S.E.	C.R.	P	Label
IE	.736	.105	6.989	***	par_21
IN2	1.180	.115	10.223	***	par_22
e13	.271	.034	8.088	***	par_23
e15	.230	.033	6.975	***	par_24
e14	.130	.025	5.195	***	par_25
e16	.268	.039	6.919	***	par_26
e17	.245	.036	6.843	***	par_27
e18	.237	.035	6.716	***	par_28
e19	.234	.026	9.038	***	par_29
e20	.768	.141	5.443	***	par_30
e21	.349	.046	7.526	***	par_31
e22	.339	.045	7.495	***	par_32
e23	.284	.042	6.788	***	par_33

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
I6	.728
I5	.681
I4	.678
P5	.269
P4	.109
S6	.811
S5	.805
S4	.802
A6	.861
A5	.792
A4	.725

Matrices (Group number 1 - Default model)

Implied Covariances (Group number 1 - Default model)

	IN2	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
IN2	1.180											
I6	.575	1.043										
I5	.561	.741	1.062									
I4	.566	.748	.729	1.085								
P5	.161	.307	.300	.303	1.050							
P4	-.051	-.098	-.095	-.096	-.090	.262						
S6	.598	.590	.576	.581	.185	-.059	1.255					
S5	.597	.589	.575	.580	.185	-.059	1.016	1.260				
S4	.617	.609	.594	.600	.191	-.061	1.050	1.049	1.352			
A6	.596	.479	.467	.472	.096	-.030	.562	.561	.580	.936		
A5	.622	.500	.488	.492	.100	-.032	.587	.585	.605	.841	1.108	
A4	.561	.451	.440	.444	.090	-.029	.529	.528	.546	.759	.792	.985

Implied Correlations (Group number 1 - Default model)

	IN2	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
IN2	1.000											
I6	.518	1.000										
I5	.501	.704	1.000									
I4	.500	.703	.679	1.000								
P5	.144	.294	.284	.284	1.000							
P4	-.092	-.187	-.181	-.180	-.171	1.000						
S6	.492	.516	.499	.498	.161	-.103	1.000					
S5	.490	.514	.497	.496	.161	-.102	.808	1.000				
S4	.489	.513	.496	.495	.160	-.102	.806	.804	1.000			
A6	.568	.485	.469	.468	.096	-.061	.518	.517	.515	1.000		
A5	.544	.465	.450	.449	.092	-.059	.497	.495	.494	.826	1.000	
A4	.521	.445	.430	.429	.088	-.056	.475	.474	.473	.790	.758	1.000

Factor Score Weights (Group number 1 - Default model)

	IN2	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
IE	.056	.280	.228	.224	.046	-.048	.025	.024	.023	.025	.015	.011
PBC	.004	-.040	-.033	-.032	-.053	.055	-.001	-.001	-.001	.015	.009	.007
SN	.021	.022	.018	.018	.001	-.001	.306	.296	.280	.023	.013	.010

	IN2	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
AT	.036	.011	.009	.009	-.007	.008	.011	.011	.010	.398	.234	.179

Total Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I6	1.016	.000	.000	.000
I5	.991	.000	.000	.000
I4	1.000	.000	.000	.000
P5	.000	-3.143	.000	.000
P4	.000	1.000	.000	.000
S6	.000	.000	.969	.000
S5	.000	.000	.967	.000
S4	.000	.000	1.000	.000
A6	.000	.000	.000	1.063
A5	.000	.000	.000	1.109
A4	.000	.000	.000	1.000

Standardized Total Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I6	.853	.000	.000	.000
I5	.825	.000	.000	.000
I4	.824	.000	.000	.000
P5	.000	-.518	.000	.000
P4	.000	.330	.000	.000
S6	.000	.000	.901	.000
S5	.000	.000	.897	.000
S4	.000	.000	.895	.000
A6	.000	.000	.000	.928
A5	.000	.000	.000	.890
A4	.000	.000	.000	.851

Direct Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I6	1.016	.000	.000	.000
I5	.991	.000	.000	.000
I4	1.000	.000	.000	.000
P5	.000	-3.143	.000	.000
P4	.000	1.000	.000	.000
S6	.000	.000	.969	.000
S5	.000	.000	.967	.000
S4	.000	.000	1.000	.000
A6	.000	.000	.000	1.063
A5	.000	.000	.000	1.109
A4	.000	.000	.000	1.000

Standardized Direct Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I6	.853	.000	.000	.000
I5	.825	.000	.000	.000
I4	.824	.000	.000	.000
P5	.000	-.518	.000	.000
P4	.000	.330	.000	.000
S6	.000	.000	.901	.000
S5	.000	.000	.897	.000
S4	.000	.000	.895	.000
A6	.000	.000	.000	.928
A5	.000	.000	.000	.890
A4	.000	.000	.000	.851

I

ndirect Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I6	.000	.000	.000	.000
I5	.000	.000	.000	.000

	IE	PBC	SN	AT
I4	.000	.000	.000	.000
P5	.000	.000	.000	.000
P4	.000	.000	.000	.000
S6	.000	.000	.000	.000
S5	.000	.000	.000	.000
S4	.000	.000	.000	.000
A6	.000	.000	.000	.000
A5	.000	.000	.000	.000
A4	.000	.000	.000	.000

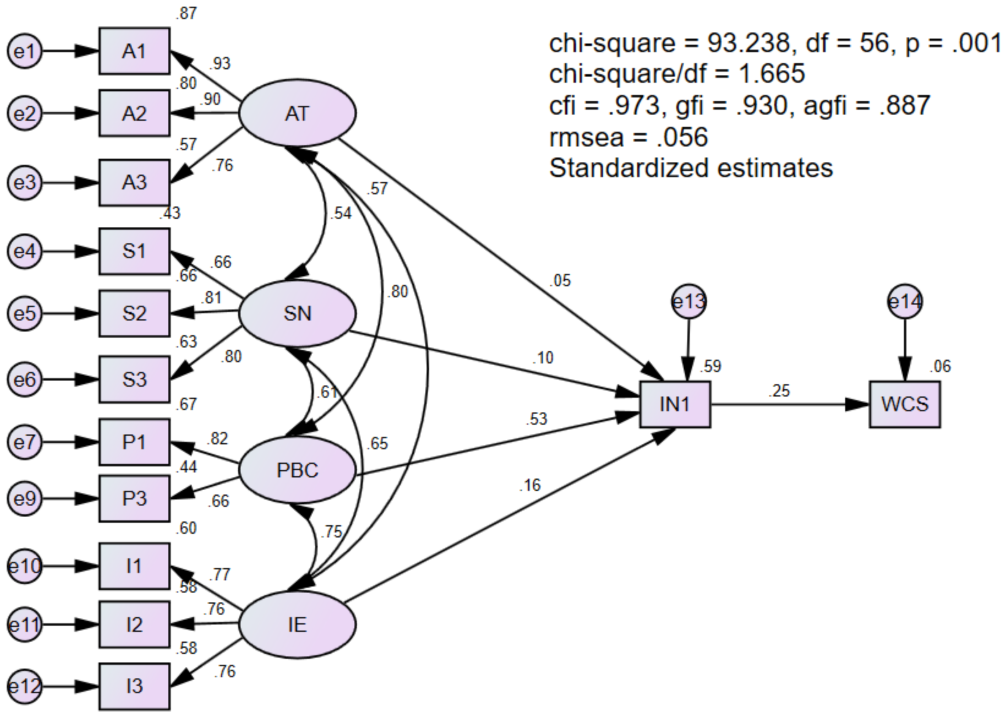
Standardized Indirect Effects (Group number 1 - Default model)

	IE	PBC	SN	AT
I6	.000	.000	.000	.000
I5	.000	.000	.000	.000
I4	.000	.000	.000	.000
P5	.000	.000	.000	.000
P4	.000	.000	.000	.000
S6	.000	.000	.000	.000
S5	.000	.000	.000	.000
S4	.000	.000	.000	.000
A6	.000	.000	.000	.000
A5	.000	.000	.000	.000
A4	.000	.000	.000	.000

APPENDIX III

RESULTS OF STRUCTURAL EQUATION MODEL (SEM)

Model I



Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	91
Number of distinct parameters to be estimated:	35
Degrees of freedom (91 - 35):	56

Result (Default model)

Minimum was achieved

Chi-square = 93.238

Degrees of freedom = 56

Probability level = .001

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
IN1	<---	AT	.058	.171	.336	.737	par_8
IN1	<---	SN	.164	.135	1.217	.224	par_9
IN1	<---	PBC	.731	.296	2.466	.014	par_10
IN1	<---	IE	.217	.176	1.235	.217	par_11
A1	<---	AT	1.000				
A2	<---	AT	.937	.048	19.525	***	par_1
A3	<---	AT	.858	.061	14.142	***	par_2
S1	<---	SN	1.000				
S2	<---	SN	1.298	.142	9.140	***	par_3
S3	<---	SN	1.338	.148	9.059	***	par_4
P1	<---	PBC	1.000				
P3	<---	PBC	.810	.085	9.505	***	par_5
I1	<---	IE	1.000				
I2	<---	IE	1.001	.096	10.460	***	par_6
I3	<---	IE	1.007	.097	10.418	***	par_7
WCS	<---	IN1	1.187	.317	3.742	***	par_12

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
IN1	<---	AT	.046
IN1	<---	SN	.103
IN1	<---	PBC	.532
IN1	<---	IE	.159
A1	<---	AT	.933
A2	<---	AT	.896
A3	<---	AT	.756
S1	<---	SN	.659
S2	<---	SN	.812
S3	<---	SN	.795
P1	<---	PBC	.820
P3	<---	PBC	.660
I1	<---	IE	.774
I2	<---	IE	.762
I3	<---	IE	.759
WCS	<---	IN1	.251

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
SN	<-->	IE	.368	.065	5.612	***	par_13
PBC	<-->	IE	.494	.074	6.637	***	par_14
AT	<-->	PBC	.571	.074	7.676	***	par_15
AT	<-->	SN	.332	.061	5.435	***	par_16
SN	<-->	PBC	.345	.063	5.431	***	par_17
AT	<-->	IE	.409	.068	6.019	***	par_18

Correlations: (Group number 1 - Default model)

			Estimate
SN	<-->	IE	.647
PBC	<-->	IE	.750
AT	<-->	PBC	.801
AT	<-->	SN	.539
SN	<-->	PBC	.608
AT	<-->	IE	.572

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
AT	.773	.089	8.670	***	par_19
SN	.490	.099	4.942	***	par_20
PBC	.657	.103	6.394	***	par_21
IE	.660	.107	6.158	***	par_22
e13	.511	.065	7.813	***	par_23
e1	.115	.026	4.477	***	par_24
e2	.166	.026	6.336	***	par_25
e3	.427	.047	9.141	***	par_26
e4	.639	.074	8.656	***	par_27
e5	.425	.070	6.089	***	par_28
e6	.510	.078	6.528	***	par_29
e7	.320	.058	5.504	***	par_30
e9	.557	.063	8.805	***	par_31
e10	.440	.060	7.332	***	par_32
e11	.477	.063	7.557	***	par_33
e12	.494	.065	7.615	***	par_34
e14	26.071	2.550	10.223	***	par_35

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
IN1	.588

	Estimate
WCS	.063
I3	.575
I2	.581
I1	.600
P3	.436
P1	.672
S3	.632
S2	.660
S1	.434
A3	.571
A2	.803
A1	.871

Matrices (Group number 1 - Default model)

Implied Covariances (Group number 1 - Default model)

	IN1	WCS	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
IN1	1.239												
WCS	1.471	27.818											
I3	.592	.703	1.164										
I2	.588	.699	.665	1.138									
I1	.588	.698	.665	.660	1.100								
P3	.548	.651	.403	.400	.400	.987							

	IN1	WCS	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
P1	.677	.804	.497	.494	.494	.532	.977						
S3	.577	.685	.495	.492	.492	.373	.461	1.386					
S2	.560	.665	.481	.478	.477	.362	.447	.851	1.251				
S1	.431	.512	.370	.368	.368	.279	.345	.655	.636	1.129			
A3	.519	.616	.353	.351	.351	.396	.490	.381	.369	.284	.995		
A2	.567	.673	.386	.383	.383	.433	.535	.416	.404	.311	.621	.846	
A1	.605	.719	.412	.409	.409	.462	.571	.444	.431	.332	.663	.725	.888

Implied Correlations (Group number 1 - Default model)

	IN1	WCS	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
IN1	1.000												
WCS	.251	1.000											
I3	.493	.124	1.000										
I2	.496	.124	.578	1.000									
I1	.504	.126	.587	.590	1.000								
P3	.495	.124	.376	.377	.383	1.000							
P1	.615	.154	.466	.468	.476	.542	1.000						
S3	.440	.110	.390	.392	.398	.319	.396	1.000					
S2	.450	.113	.399	.400	.407	.326	.405	.646	1.000				
S1	.365	.091	.323	.325	.330	.264	.328	.524	.535	1.000			
A3	.467	.117	.328	.330	.335	.400	.497	.324	.331	.268	1.000		
A2	.554	.139	.389	.391	.397	.474	.589	.384	.393	.318	.677	1.000	
A1	.577	.145	.405	.407	.414	.494	.613	.400	.409	.331	.705	.836	1.000

Factor Score Weights (Group number 1 - Default model)

	IN1	WCS	I3	I2	I1	P3	P1	S3	S2	S1	A3	A2	A1
IE	.076	.000	.205	.211	.229	.030	.064	.030	.034	.018	.002	.006	.010
PBC	.143	.000	.042	.043	.046	.133	.286	.011	.013	.006	.030	.083	.128
SN	.036	.000	.023	.024	.026	.006	.013	.207	.241	.123	.005	.014	.022
AT	.028	.000	.002	.002	.003	.021	.046	.007	.008	.004	.108	.304	.470

Total Effects (Group number 1 - Default model)

	IE	PBC	SN	AT	IN1
IN1	.217	.731	.164	.058	.000

	IE	PBC	SN	AT	IN1
WCS	.258	.868	.195	.068	1.187
I3	1.007	.000	.000	.000	.000
I2	1.001	.000	.000	.000	.000
I1	1.000	.000	.000	.000	.000
P3	.000	.810	.000	.000	.000
P1	.000	1.000	.000	.000	.000
S3	.000	.000	1.338	.000	.000
S2	.000	.000	1.298	.000	.000
S1	.000	.000	1.000	.000	.000
A3	.000	.000	.000	.858	.000
A2	.000	.000	.000	.937	.000
A1	.000	.000	.000	1.000	.000

Standardized Total Effects (Group number 1 - Default model)

	IE	PBC	SN	AT	IN1
IN1	.159	.532	.103	.046	.000
WCS	.040	.133	.026	.011	.251
I3	.759	.000	.000	.000	.000
I2	.762	.000	.000	.000	.000
I1	.774	.000	.000	.000	.000
P3	.000	.660	.000	.000	.000
P1	.000	.820	.000	.000	.000
S3	.000	.000	.795	.000	.000
S2	.000	.000	.812	.000	.000
S1	.000	.000	.659	.000	.000

	IE	PBC	SN	AT	IN1
A3	.000	.000	.000	.756	.000
A2	.000	.000	.000	.896	.000
A1	.000	.000	.000	.933	.000

Direct Effects (Group number 1 - Default model)

	IE	PBC	SN	AT	IN1
IN1	.217	.731	.164	.058	.000
WCS	.000	.000	.000	.000	1.187
I3	1.007	.000	.000	.000	.000
I2	1.001	.000	.000	.000	.000
I1	1.000	.000	.000	.000	.000
P3	.000	.810	.000	.000	.000
P1	.000	1.000	.000	.000	.000
S3	.000	.000	1.338	.000	.000
S2	.000	.000	1.298	.000	.000
S1	.000	.000	1.000	.000	.000
A3	.000	.000	.000	.858	.000
A2	.000	.000	.000	.937	.000
A1	.000	.000	.000	1.000	.000

Standardized Direct Effects (Group number 1 - Default model)

	IE	PBC	SN	AT	IN1
IN1	.159	.532	.103	.046	.000
WCS	.000	.000	.000	.000	.251
I3	.759	.000	.000	.000	.000
I2	.762	.000	.000	.000	.000
I1	.774	.000	.000	.000	.000
P3	.000	.660	.000	.000	.000
P1	.000	.820	.000	.000	.000
S3	.000	.000	.795	.000	.000
S2	.000	.000	.812	.000	.000

	IE	PBC	SN	AT	IN1
S1	.000	.000	.659	.000	.000
A3	.000	.000	.000	.756	.000
A2	.000	.000	.000	.896	.000
A1	.000	.000	.000	.933	.000

Indirect Effects (Group number 1 - Default model)

	IE	PBC	SN	AT	IN1
IN1	.000	.000	.000	.000	.000
WCS	.258	.868	.195	.068	.000
I3	.000	.000	.000	.000	.000
I2	.000	.000	.000	.000	.000
I1	.000	.000	.000	.000	.000
P3	.000	.000	.000	.000	.000
P1	.000	.000	.000	.000	.000
S3	.000	.000	.000	.000	.000
S2	.000	.000	.000	.000	.000
S1	.000	.000	.000	.000	.000
A3	.000	.000	.000	.000	.000
A2	.000	.000	.000	.000	.000
A1	.000	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	IE	PBC	SN	AT	IN1
IN1	.000	.000	.000	.000	.000
WCS	.040	.133	.026	.011	.000
I3	.000	.000	.000	.000	.000
I2	.000	.000	.000	.000	.000
I1	.000	.000	.000	.000	.000
P3	.000	.000	.000	.000	.000
P1	.000	.000	.000	.000	.000
S3	.000	.000	.000	.000	.000

	IE	PBC	SN	AT	IN1
S2	.000	.000	.000	.000	.000
S1	.000	.000	.000	.000	.000
A3	.000	.000	.000	.000	.000
A2	.000	.000	.000	.000	.000
A1	.000	.000	.000	.000	.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	35	93.238	56	.001	1.665
Saturated model	91	.000	0		
Independence model	13	1448.002	78	.000	18.564

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.154	.930	.887	.572
Saturated model	.000	1.000		
Independence model	.568	.307	.191	.263

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.936	.910	.973	.962	.973
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.718	.672	.698
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	37.238	14.534	67.831
Saturated model	.000	.000	.000
Independence model	1370.002	1250.173	1497.226

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.446	.178	.070	.325
Saturated model	.000	.000	.000	.000
Independence model	6.928	6.555	5.982	7.164

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.056	.035	.076	.285
Independence model	.290	.277	.303	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	163.238	168.264	280.387	315.387
Saturated model	182.000	195.067	486.587	577.587
Independence model	1474.002	1475.868	1517.514	1530.514

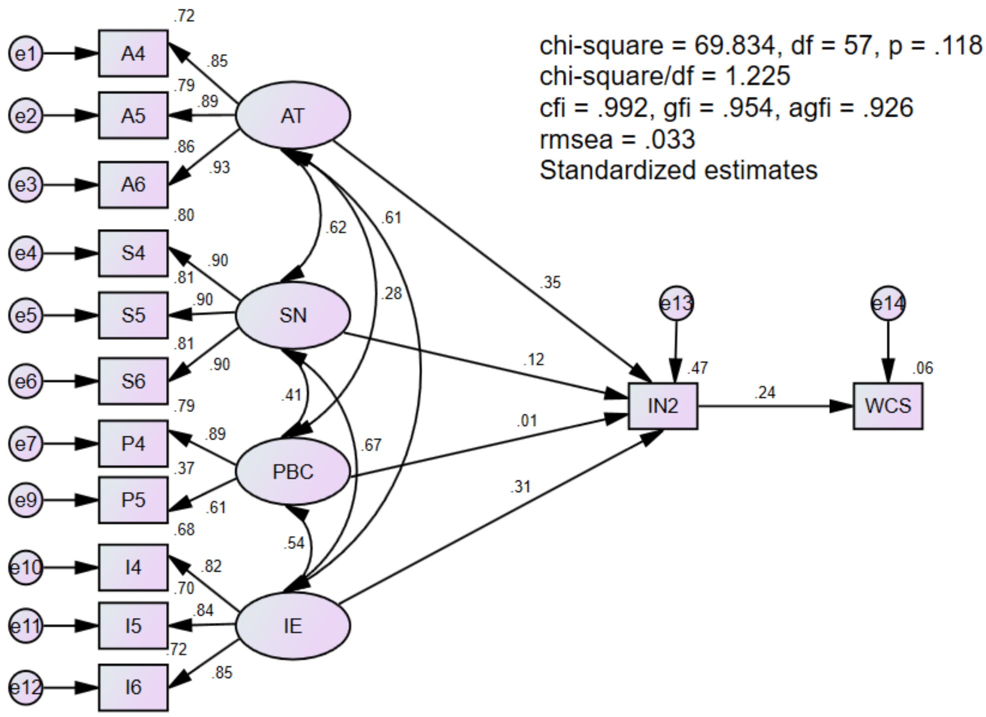
ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.781	.672	.927	.805
Saturated model	.871	.871	.871	.933
Independence model	7.053	6.479	7.661	7.062

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	167	188
Independence model	15	16

Model II



Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments:	91
Number of distinct parameters to be estimated:	34
Degrees of freedom (91 - 34):	57

Result (Default model)

Minimum was achieved

Chi-square = 69.834

Degrees of freedom = 57

Probability level = .118

Group number 1 (Group number 1 - Default model)

Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
IN2	<---	AT	.445	.102	4.378	***	par_7
IN2	<---	SN	.125	.088	1.425	.154	par_8
IN2	<---	PBC	.015	.080	.185	.853	par_9
IN2	<---	IE	.388	.125	3.110	.002	par_10
A5	<---	AT	1.111	.066	16.903	***	par_1
A6	<---	AT	1.065	.059	17.946	***	par_2
S5	<---	SN	.968	.051	19.043	***	par_3
S6	<---	SN	.969	.051	19.174	***	par_4
I5	<---	IE	1.003	.074	13.594	***	par_5
I6	<---	IE	1.009	.073	13.830	***	par_6
WCS	<---	IN2	1.158	.326	3.557	***	par_11
I4	<---	IE	1.000				
S4	<---	SN	1.000				
A4	<---	AT	1.000				
P4	<---	PBC	1.000				
P5	<---	PBC	.627	.080	7.824	***	par_18

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
IN2	<---	AT	.346
IN2	<---	SN	.120
IN2	<---	PBC	.014
IN2	<---	IE	.307
A5	<---	AT	.890
A6	<---	AT	.929
S5	<---	SN	.898
S6	<---	SN	.901
I5	<---	IE	.835
I6	<---	IE	.848
WCS	<---	IN2	.239

			Estimate
I4	<---	IE	.824
S4	<---	SN	.896
A4	<---	AT	.850
P4	<---	PBC	.889
P5	<---	PBC	.607

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
SN	<-->	IE	.607	.087	6.996	***	par_12
IE	<-->	PBC	.465	.073	6.351	***	par_13
AT	<-->	PBC	.232	.068	3.426	***	par_14
AT	<-->	SN	.548	.081	6.781	***	par_15
SN	<-->	PBC	.433	.084	5.154	***	par_16
AT	<-->	IE	.446	.069	6.457	***	par_17

Correlations: (Group number 1 - Default model)

			Estimate
SN	<-->	IE	.675
IE	<-->	PBC	.539
AT	<-->	PBC	.275
AT	<-->	SN	.622
SN	<-->	PBC	.414
AT	<-->	IE	.613

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
PBC	1.000				
AT	.714	.095	7.515	***	par_19

	Estimate	S.E.	C.R.	P	Label
SN	1.090	.133	8.197	***	par_20
IE	.742	.106	7.031	***	par_21
e13	.629	.064	9.775	***	par_22
e1	.273	.034	8.113	***	par_23
e2	.230	.033	6.974	***	par_24
e3	.129	.025	5.150	***	par_25
e4	.268	.039	6.936	***	par_26
e5	.245	.036	6.858	***	par_27
e6	.237	.035	6.727	***	par_28
e7	.265	.101	2.626	.009	par_29
e9	.672	.081	8.275	***	par_30
e10	.351	.047	7.531	***	par_31
e11	.323	.044	7.280	***	par_32
e12	.296	.042	6.968	***	par_33
e14	26.236	2.566	10.223	***	par_34

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
IN2	.469
WCS	.057
I6	.718
I5	.698
I4	.679
P5	.369
P4	.790
S6	.812
S5	.806
S4	.803
A6	.863
A5	.793
A4	.723

Matrices (Group number 1 - Default model)

Implied Covariances (Group number 1 - Default model)

	IN2	WCS	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
IN2	1.184												
WCS	1.371	27.824											
I6	.575	.665	1.051										
I5	.571	.662	.751	1.070									
I4	.570	.660	.748	.744	1.093								
P5	.221	.256	.294	.292	.291	1.064							
P4	.353	.409	.469	.466	.465	.627	1.265						
S6	.604	.699	.593	.590	.588	.263	.419	1.262					
S5	.602	.698	.592	.589	.587	.262	.419	1.023	1.266				
S4	.623	.721	.612	.609	.607	.271	.433	1.057	1.055	1.358			
A6	.600	.695	.480	.477	.475	.155	.248	.566	.565	.584	.938		
A5	.626	.725	.500	.497	.496	.162	.258	.591	.589	.609	.844	1.111	
A4	.563	.652	.450	.448	.446	.146	.232	.532	.531	.548	.760	.793	.987

Implied Correlations (Group number 1 - Default model)

	IN2	WCS	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
IN2	1.000												
WCS	.239	1.000											
I6	.515	.123	1.000										
I5	.508	.121	.708	1.000									
I4	.501	.120	.698	.688	1.000								
P5	.197	.047	.278	.274	.270	1.000							
P4	.288	.069	.406	.400	.395	.540	1.000						
S6	.494	.118	.515	.508	.501	.227	.332	1.000					

	IN2	WCS	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
S5	.492	.118	.513	.506	.499	.226	.331	.809	1.000				
S4	.491	.117	.512	.505	.498	.225	.330	.807	.805	1.000			
A6	.569	.136	.483	.476	.469	.155	.227	.520	.519	.517	1.000		
A5	.546	.130	.463	.456	.450	.149	.218	.499	.497	.496	.827	1.000	
A4	.521	.124	.442	.436	.430	.142	.208	.476	.475	.474	.790	.757	1.000

Factor Score Weights (Group number 1 - Default model)

	IN2	WCS	I6	I5	I4	P5	P4	S6	S5	S4	A6	A5	A4
PBC	.011	.000	.040	.037	.034	.163	.658	.013	.013	.012	-.012	-.007	-.006
IE	.052	.000	.267	.243	.224	.011	.045	.023	.022	.021	.024	.014	.011
SN	.020	.000	.019	.017	.016	.003	.012	.305	.295	.279	.023	.014	.010
AT	.037	.000	.010	.009	.008	-.001	-.006	.012	.011	.011	.400	.234	.177

Total Effects (Group number 1 - Default model)

	PBC	IE	SN	AT	IN2
IN2	.015	.388	.125	.445	.000
WCS	.017	.450	.145	.516	1.158
I6	.000	1.009	.000	.000	.000
I5	.000	1.003	.000	.000	.000
I4	.000	1.000	.000	.000	.000
P5	.627	.000	.000	.000	.000
P4	1.000	.000	.000	.000	.000
S6	.000	.000	.969	.000	.000
S5	.000	.000	.968	.000	.000
S4	.000	.000	1.000	.000	.000
A6	.000	.000	.000	1.065	.000

	PBC	IE	SN	AT	IN2
A5	.000	.000	.000	1.111	.000
A4	.000	.000	.000	1.000	.000

Standardized Total Effects (Group number 1 - Default model)

	PBC	IE	SN	AT	IN2
IN2	.014	.307	.120	.346	.000
WCS	.003	.073	.029	.083	.239
I6	.000	.848	.000	.000	.000
I5	.000	.835	.000	.000	.000
I4	.000	.824	.000	.000	.000
P5	.607	.000	.000	.000	.000
P4	.889	.000	.000	.000	.000
S6	.000	.000	.901	.000	.000
S5	.000	.000	.898	.000	.000
S4	.000	.000	.896	.000	.000
A6	.000	.000	.000	.929	.000
A5	.000	.000	.000	.890	.000
A4	.000	.000	.000	.850	.000

Direct Effects (Group number 1 - Default model)

	PBC	IE	SN	AT	IN2
IN2	.015	.388	.125	.445	.000
WCS	.000	.000	.000	.000	1.158
I6	.000	1.009	.000	.000	.000
I5	.000	1.003	.000	.000	.000
I4	.000	1.000	.000	.000	.000
P5	.627	.000	.000	.000	.000
P4	1.000	.000	.000	.000	.000
S6	.000	.000	.969	.000	.000
S5	.000	.000	.968	.000	.000
S4	.000	.000	1.000	.000	.000

	PBC	IE	SN	AT	IN2
A6	.000	.000	.000	1.065	.000
A5	.000	.000	.000	1.111	.000
A4	.000	.000	.000	1.000	.000

Standardized Direct Effects (Group number 1 - Default model)

	PBC	IE	SN	AT	IN2
IN2	.014	.307	.120	.346	.000
WCS	.000	.000	.000	.000	.239
I6	.000	.848	.000	.000	.000
I5	.000	.835	.000	.000	.000
I4	.000	.824	.000	.000	.000
P5	.607	.000	.000	.000	.000
P4	.889	.000	.000	.000	.000
S6	.000	.000	.901	.000	.000
S5	.000	.000	.898	.000	.000
S4	.000	.000	.896	.000	.000
A6	.000	.000	.000	.929	.000
A5	.000	.000	.000	.890	.000
A4	.000	.000	.000	.850	.000

Indirect Effects (Group number 1 - Default model)

	PBC	IE	SN	AT	IN2
IN2	.000	.000	.000	.000	.000
WCS	.017	.450	.145	.516	.000
I6	.000	.000	.000	.000	.000
I5	.000	.000	.000	.000	.000
I4	.000	.000	.000	.000	.000
P5	.000	.000	.000	.000	.000
P4	.000	.000	.000	.000	.000
S6	.000	.000	.000	.000	.000
S5	.000	.000	.000	.000	.000

	PBC	IE	SN	AT	IN2
S4	.000	.000	.000	.000	.000
A6	.000	.000	.000	.000	.000
A5	.000	.000	.000	.000	.000
A4	.000	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	PBC	IE	SN	AT	IN2
IN2	.000	.000	.000	.000	.000
WCS	.003	.073	.029	.083	.000
I6	.000	.000	.000	.000	.000
I5	.000	.000	.000	.000	.000
I4	.000	.000	.000	.000	.000
P5	.000	.000	.000	.000	.000
P4	.000	.000	.000	.000	.000
S6	.000	.000	.000	.000	.000
S5	.000	.000	.000	.000	.000
S4	.000	.000	.000	.000	.000
A6	.000	.000	.000	.000	.000
A5	.000	.000	.000	.000	.000
A4	.000	.000	.000	.000	.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	34	69.834	57	.118	1.225
Saturated model	91	.000	0		
Independence model	13	1788.107	78	.000	22.924

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.191	.954	.926	.597
Saturated model	.000	1.000		

Model	RMR	GFI	AGFI	PGFI
Independence model	.571	.288	.169	.247

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.961	.947	.993	.990	.992
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.731	.702	.725
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	12.834	.000	38.150
Saturated model	.000	.000	.000
Independence model	1710.107	1576.166	1851.423

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.334	.061	.000	.183
Saturated model	.000	.000	.000	.000
Independence model	8.556	8.182	7.541	8.858

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.033	.000	.057	.871
Independence model	.324	.311	.337	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	137.834	142.716	251.635	285.635
Saturated model	182.000	195.067	486.587	577.587
Independence model	1814.107	1815.973	1857.619	1870.619

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.659	.598	.781	.683
Saturated model	.871	.871	.871	.933
Independence model	8.680	8.039	9.356	8.689

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	227	254
Independence model	12	13

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