Behavioral Intention Analysis of Waste Separation in China: Case Study of Hangzhou Using Theory of Planned Behavior

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Behavioral Intention Analysis of Waste Separation in China - Case Study of Hangzhou Using Theory of Planned Behavior

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Abstract: In China, governments are promoting waste management as an urgent environmental issue. Hangzhou is one of eight cities in China that have launched a pilot run for household waste separation since 2010. The government survey and a previous study of the authors have confirmed the gap between citizens' positive attitudes and their real behavior related to waste separation. In our study, the theory of planned behavior (TPB) is applied to analyse the factors that could influence the behavioral intention of the citizens towards separating waste. The structural model based on TPB was constructed to represent the framework of the citizens' intentions related to their waste separation behviour, based on a pilot survey and expert interview. Following the model, a 211-sample questionnaire survey was designed and conducted in Hangzhou. 19 extracted factors are categorized and structured following TPB. The result shows: attitude, subjective norm, and perceived behavioral control have positive influence on behavioral intention; perceived behavioral control exerts stronger influence than the other factors. Based on the findings, this study discusses policy implications and recommendations for improving the current policy and the situation of household waste separation.

1. INTRODUCTION

Since the "reform and open-door" policy implemented in 1978, China has made huge progress in economic growth and increasing incomes, as a result, the quantity of household waste has increased rapidly as well (Huang et al., 2006). Many cities in China are confronted with the situation of a "city besieged by waste". Hangzhou, the capital city of Zhejiang Province, is facing the same problem. Due to rapid economic and population growth, the amount of household waste in Hangzhou has more than doubled, from 1.42 million ton in 2005 to 3.31 million tons in 2014 (Figure 1) (Hangzhou Environmental Protection Bureau, 2015). To mitigate this situation, Hangzhou, along with seven other cities in China, launched a pilot project of household waste separation in 2010.

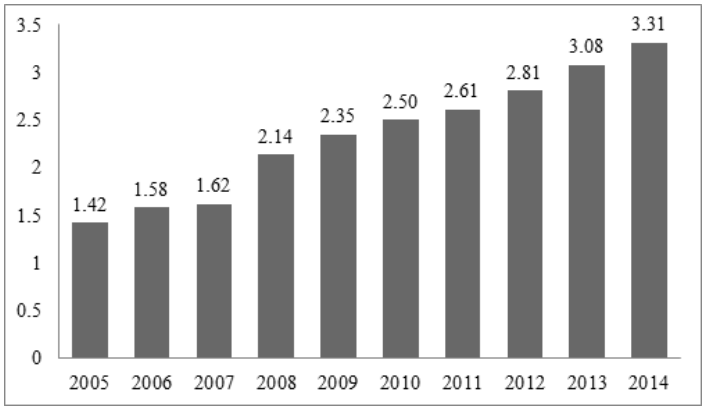


Figure 1. A trend of amount of household waste in Hangzhou from 2005 to 2014 (million tons) Source: Hangzhou Environmental Protection Bureau (2015)

Separating waste is one of the most effective ways to manage waste. The current waste separation system in Hangzhou divides household waste into four types: i.e. kitchen waste, recycled waste, hazard waste and other waste. Presently landfill is the main method to dispose of waste in Hangzhou, but the capability of landfills no longer satisfies the amount of waste. Therefore, separating waste helps reduce the total amount of waste as recycled waste can be recycled and part of kitchen waste can be utilized as biomass to generate electricity. The alternative method appears to be incineration for which waste separation is an indispensable prerequisite. Without waste separation, toxic gas such as SO_2 and dioxin emitted from the incineration plants largely exceed the standard amount, thereby exerting negative impacts on the atmosphere and residents' health. Household waste occupies a significant amount (30.46%) of the total municipal waste (Hangzhou Environmental Protection Bureau, 2015). Hence, household waste is focused on in this research.

Based on a study of the history and current state of household waste separation in Japan, a rough comparison of the legal system in Japan and that of Hangzhou was made. Japan has tackled its waste problem for more than 30 years and the current waste management system is one of the most mature systems in the world. In addition, the main cities, such as Tokyo, have some similar features as Hangzhou in terms of waste management development. Through more than 40 years, Japan has established a sound legal system on waste management. Currently the most relevant law about waste management is the Waste Management and Public Cleansing Law which took effect in 1970 and falls under the Fundamental Plan for Establishing a Sound Material-Cycle Society (2003). Above the Plan is the Basic Act for Establishing a Sound-Material-Cycle Society (Basic Framework Act, 2000) which comes under the Basic Environmental Plan which was enacted in 1994 (Ministry of the Environment of Japan, 2012).

Hangzhou has also enacted a series of law and regulations on waste management. Regulation on the management of the city appearance and environmental sanitation in Hangzhou (Chinese Government Public Information Online, 2007) took effect from 1997. In December of 2015, the Regulation on Household Waste Management in Hangzhou (Legal Affairs Office of Hangzhou Municipal Government, 2015) came into force, in which detailed contents on regulating household waste separation is included. Under the Regulation, there are measures for municipal household waste management (2013) (Hangzhou Municipal Government, 2012) and methods and standards for household waste separation (2010) (Hangzhou.com.cn., 2013). Compared with Japan, Hangzhou started to establish its

comprehensive legal system on waste management much later. Also, many regulations and policies are new, so not yet mature.

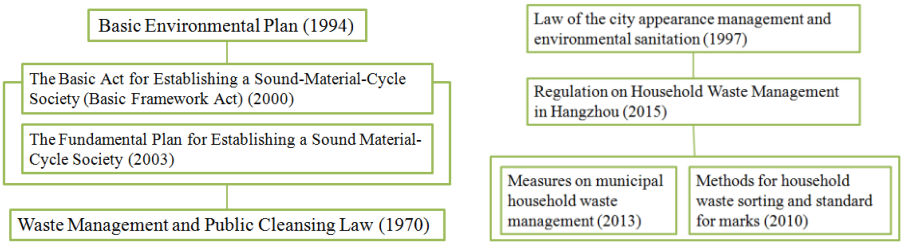


Figure 2. Legal system in Japan (left) and China (right)

Most citizens hold a positive attitude towards the waste separation project while actual performance did not reflect this. At the beginning of the project, the municipal office conducted a survey regarding citizens' attitude towards sorting activities. It showed that 97.82% of citizens think waste separation is good and should be implemented in the city (Zheng, 2013). Though more than five years have passed, significant progress was not observed in most communities. It is reported frequently that in numerous communities, household waste is still being mixed and residents' awareness is still low. Despite general unsatisfactory consequence, there are some communities which have achieved good effects and been regarded as model communities. By observing the situations above, the initial research question is why citizens do not take actual action whilst they have a good attitude, and what other factors influence their actual behavior.

The current waste separation system was merely implemented in urban areas (4,876 km2, 9 districts) which took up approximately 29.4% of the total area of Hangzhou. By the end of 2014, there were 8.892 million long-term residents in Hangzhou, with 6.678 million (75.1%) in the urban area. In urban areas, the average population density reached 1,461 people/km^2 in 2014. Particularly, the number was as high as 19,594 people/km^2 and 17,235 people/km^2 respectively in the core districts, i.e., Shangcheng and Xiacheng District (Hangzhou Statistical Information Net, 2015).

Not only population density, but also economic growth have led to the waste problem in Hangzhou, one of the most developed cities in China. The gross domestic product (GDP) per capita in Hangzhou in 2014 reached around US$16,000 (103,813CNY) which is as more than twice the average level of that in China (US$7,200, 46,628.5CNY) (Hangzhou Statistical Information Net, 2015). The annual municipal GDP growth rate kept above 8% in past five years (Hangzhou.com.cn, 2015). To some extent, Hangzhou can represent many other cities which have similar development features, by that reasoning this case study is also generally applicable in those areas.

From the observation above, it is not difficult to deem that there is a gap between people's attitudes and their actual behavior, which leads to a concern about other potential factors influencing their actual behavior besides their attitude. The key to solving this problem possibly lies in the decision-making process. Considering that the decision-making process, as a human cognitive process, is complex, the theory of planned behavior (TPB) is applied in this study to predict the behavioral intention of participating in household waste separation. The TPB model (shown in Figure 2) which consists of three main factors, attitude, subjective norms and perceived behavioral control, is based on the assumption of rational behavior and volitional consideration of actions and considers that the immediate

determinant of a behavior is the individual's intention to perform, or not (Ghani et al., 2013). The study aims to use/take the advantage of interdisciplinary research by integrating waste management with social psychology, yet to go beyond and discover the facts behind the current situation from a human behavioral perspective. Hence, the theory of planned behavior, a social psychological modelling method, is selected as a suitable tool for the study.

In the following sections, the development and application of TPB are reviewed in Section 2, the method and the survey conducted in Hangzhou are introduced in Section 3, the findings from the analysis are explained in Section 4, and some policy implications are concluded in the last section.

2. LITERATURE REVIEW

Several behavior change theories could be applied to help predict behaviors, such as the theory of reasoned action (Ajzen & Fishbein, 1980) and the theory of planned behavior (Ajzen, 1991). The psychological model used in this study is the theory of planned behavior (TPB), which is further developed from the theory of reasoned action (TRA). Initially, intentions are in turn influenced by attitude (behavioral beliefs) and subjective norms (normative beliefs). However, the theory of planned behavior was extended from the previous theory of reasoned action by adding the construct, named perceived behavior control (control beliefs), an individual's perception of whether they are able to perform the behavior or not. Attitude, subjective norms, together with perceived behavior control (PBC), account for considerable variance in actual behavior (Ajzen, 1991). Further, Liska (1984) also argues that the performance of many behaviors will be constrained by the lack of appropriate opportunities, skills and resources. The TPB provides a theoretical framework to systematically examine factors that affect behavioral change (Pakpour et al., 2014), thereby, the researchers will be able to discover the influencing factors (attitude, subjective norms, PBC) specified in the household waste separation program along with the gap between attitude and actual behavior (the fact that people have developed a willing attitude towards performing household waste separation in their community, however barely put this into practice, shows more likely the gap between intention and actual behavior) and further improves it based on the prospective results. Heretofore, the TPB has been used successfully to understand a range of environmentally responsible behaviors, for instance, an application to moderate the effects of food technology neophobia of genetically modified food (Kim, Jang, & Kim, 2014), a household waste separation case in Iran and Malaysia (Pakpour et al., 2014; Ghani et al., 2013), and so on.

Briefly, the theory of planned behavior can be described as a formation of three contents as also noted above: behavioral beliefs, normative beliefs, and control beliefs. In the case of this study, the behavioral belief is the favorable or unfavorable attitude towards household waste separation; the productivity, intellectual and challenge aspects, for example. The normative belief is the subjective norm of waste separation, the perceived social pressure from other people such as family, colleagues or superiors, while the control belief is the perceived behavioral control over performing this waste separation, the perception of the ability to do it or not (Solikhah, 2014). As it is commonly agreed, the theory of planned behavior supports that individuals who have positive attitudes together with adequate normative

facilitation, and who perceive there is less impedance to engage in the activity, should have strong intentions to perform the behavior (Fielding, McDonald, & Louis, 2008). However, intention is considered just as the immediate antecedent of behavior (Ajzen, 1991), and the likelihood or chance to behave, not the definite decision made to perform the actual behavior.

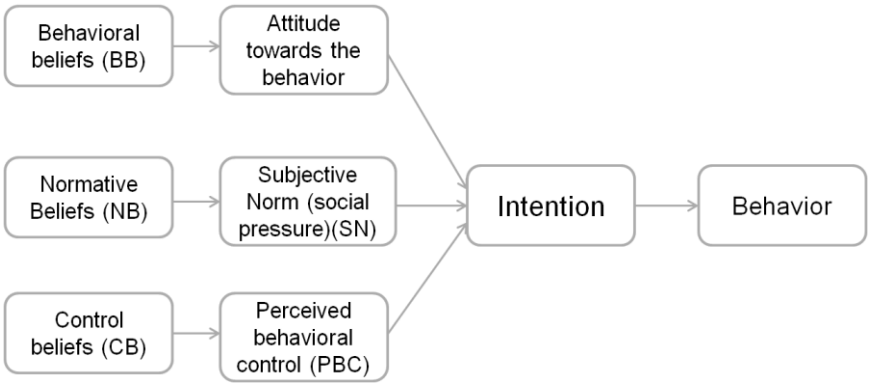


Figure 3. The TPB model used in this case study

In a case of household waste separation conducted in Malaysia, the authors (Ghani et al., 2013) mentioned that promoting waste separation is a complex process since the behavior needs considerable decision making as the process requires individuals willingly participating in sorting, preparing and storing household waste as a part of the responsibility. In a similar way, in order to smoothly promote the waste separation program primarily being piloted through communities in Hangzhou, China, theory and hypothesis-based research needs to be conducted to understand public attitudes and to analyze the pattern of people's behavior towards garbage sorting. The TPB is highly recommended to systematically identify the factors that influence participation in household waste separation.

Attitude towards the behavior is defined as the degree to which a person's positive or negative evaluation of performing the behavior is questioned. Since quality of life has been improved, environmental issues have started to draw the public's attention. General studies (Zheng, 2013) show that people are becoming strongly aware of an individual's responsibility to improve waste separation, which obviously shows their favorable attitude towards household waste separation. Nevertheless, social psychological research has shown that attitudes do not have a strong impact on people's behavior (Wicker, 1969). However, it has coincidently explained the embarrassing reality that people hold positive attitudes towards implementing household garbage sorting, but actual behavior barely reflects this. Therefore, the present stage is to examine whether the intention to perform household waste separation is formed or not.

The subjective norm refers to the perception of social pressure from other people to perform or not to perform the behavior (Ajzen, 1991). In other words, it is an individual's perception of whether other people important to the individual think the behavior should be performed (Solikhah, 2014). Armitage and Conner (2001) in 2001 have disclosed that the subjective norm is expected to be the weakest predictor of behavioral intention in the TPB.

Perceived behavioral control (PBC) requires volitional control over a behavior. Ajzen developed the PBC concept to extend the theory of reasoned action in 1991, defining it as an individual's perceived ease or difficulty of performing a particular behavior, an individual's beliefs about the presence

of factors that may facilitate or impede performance of the behavior. Perceived behavioral control (PBC) not only predicts behavioral intention but also can be used, together with intention, to predict behavior (Pakpour et al., 2014).

Some researchers have criticized the TPB suggesting that attitudes, subjective norms, and perceived behavioral control might be insufficient to predict intentions and behavior because the TPB model often neglects affective aspects of attitude and considers only rational and cognitive factors. Therefore, additional variables are commonly constructed, such as perceived need, self-identity, past behavior, affective beliefs, action planning, etc. Few studies have examined additional variables with respect to household waste behaviors (Miafodzyeva, Brandt, & Andersson, 2013).

3. METHODOLOGY AND DATA

The aims of this study are to identify and evaluate the influencing factors that cause the difference between behavioral beliefs (attitude) and actual behavior by the aid of the TPB model. Accordingly, measures to positively change people's intention to ultimately achieve wide participation in household garbage sorting are discussed in the following sections.

3.1 Structure of questionnaire

The study took a 44-sample pilot survey at the preparing/initiating stage using a paper format. All the respondents were affirmed as holding a permanent resident status. Additionally, the respondents were also randomly, nonetheless prudently, chosen from the eight districts which are progressing household waste separation programs in Hangzhou. Before conducting the survey, individual permissions were certainly acquired from the participants and the purpose of the survey and study was also specifically explained to them. Through the pilot survey, useful feedback from the survey participants was gained and used for working out the final questionnaire. The final questionnaire was constructed by utilizing the TPB and based on the pilot survey.

The questionnaire is divided into seven main parts: behavioral beliefs (BB), normative beliefs (NB), control beliefs (CB), and correspondent attitude, social norm (SN), perceived behavior control (PBC), and intention to perform sorting behavior (see figure 3). Question style is as multiple choice measured with a 7-point Likert-type scale (e.g.1= strongly disagree; 7=strongly agree).

Behavioral beliefs: According to Fishbein and Ajzen (1975), in one's behavioral beliefs, performing a particular behavior will lead to a behavioral outcome and therefore, items for behavioral beliefs are formed by strength of behavioral beliefs and outcome evaluation (OE). They need to be multiplicatively combined, or to say BBs*OE. In total, 7 items were designed with seven-point Likert scales ranging from strongly disagree (1) to strongly agree (7) for both BB and OE. A sample question of BB was: "Household garbage sorting is beneficial for keeping the family environment clean" and that of OE was: "Keeping the family environment clean is important for me".

Attitude: Items for attitude were divided into two clusters for different targets. They were: "Generally speaking, household garbage sorting is

_____ for families; is _____ for society". Each of them is measured from meaningless at all (1) to very meaningful (7) and from not important at all (1) to very important (7).

Normative beliefs: Normative beliefs are one's consideration of opinions about performing a behavior of his/her referents and according to Ajzen (2002), with regard to each normative referent, items should be formed by strength of normative beliefs and the motivation to comply (MC) with that referent. Six items were designed in total including six statements for NBs measured from should not (1) to should (7) and six statements for MC measured from very low (1) to very high (7). Correspondent statements of NBs and MC were also multiplied and combined. A sample question for NB was: "My families think I ____ carry out garbage sorting at home", and the correspondent MC was: "The possibility for me to listen to them is ____".

Subjective norm: There were three statements for SN covering different normative scales: "I think most Hangzhou citizens would do household garbage sorting", ranging from strongly disagree (1) to strongly agree (7); "People who are important to me think I ___ carry out household garbage sorting", from should not (1) to should (7); and "New regulation will take effect soon while some communities have specific reward and punishment systems. Under those express terms, my enthusiasm towards participating in household garbage sorting will increase", from strongly disagree (1) to strongly agree (7).

Control beliefs: Control beliefs about whether it is easy or not to perform a behavior will be influenced by control factors which are the perceived facilitators or inhibitors standing in front of performing that behavior. For that, both the strength of control beliefs (CBs) and how powerful control factors will facilitate or impede performance (P) need to be assessed in this section (Ajzen, 2002). That is, statements of CBs and P need to be again multiplicatively combined (i.e., [CBi*Pi]). There were six items in total and one of them was: for CBs, "I think household garbage sorting is a time-consuming thing", measured from strongly disagree (1) to strongly disagree (7); and for P, "Whether it's time-consuming or not would influence me from participating in garbage sorting", measured from not at all (1) to greatly will (7).

Perceived behavioral control: Items for PBC were repeatedly concerned due to the special relationship with behavioral intention to actual behavior. Primarily, it is assumed that PBC influences positively the formation of behavioral intention and the possibility to act. Armitage and Conner (2001) provided another assumption that is "PBC will influence directly actual behavior to the extent that perceived control reflects actual control". Three statements were concluded at the end measuring from strongly disagree (1) to strongly agree (7). For instance, "I have ability (personal ability, e.g. knowledge about sorting garbage, economic ability) to participate in household garbage sorting" and "I think our family is able to do garbage sorting.".

Behavioral intention: One of the items demonstrating the strength of behavioral intention towards participating household waste separation was "I intend to start or perform better in garbage sorting in half a year. " measured from strongly disagree (1) to strongly agree (7).

3.2 Survey method and respondents' profile

The survey was conducted online through a Chinese professional online survey conductor, SOJUMP Corporation. The questionnaire was designed

and distributed in Chinese originally and translated into an English version for academic use. In Hangzhou, internet penetration is up to 80.0%, thus the online samples can represent most citizens. In the final online questionnaire, the purpose of the survey was explained at the beginning (66wz.com, 2014).

A total of 211 questionnaires were collected. Since the questionnaires were distributed by using a sample service from a professional online survey company, questionnaires were ensured of their quality generally in terms of completeness and responsibility.

Of the 211 completed and usable questionnaires, females and males represented about half of the sample respectively (54.0% and 46.0%). Among respondents, up to 54.0% were between 20 and 30 years old, the second largest age group was 30 to 40 years old (26.1%); about two-thirds of them held a university/college degree (65.9%). The average number of respondents' family members (including the respondent) is 3.6; more than half of the respondents' family has two generations in the household (57.8%); more than one-third of families have income between 10,000 CNY and 20,000 CNY per month (35.6%). Most profile figures are close to normal distribution, which indicates the appropriateness of the sample.

3.3 Data analysis

In this study, the Statistical Package for Social Science (SPSS) software was used to examine the correlations between each construct, and Cronbach's reliability was used to perform a factor analysis (Bacon, Lynd Bacon & Associates Limited, & SPSS Incorporated, 1997). Then, a path analysis was conducted with Analysis of Moment Structures (AMOS) (Wuensch, 2016). AMOS, initially created for structural equation modelling (SEM), path analysis ,etc., is able to read the data from an SPSS database or other sources and accordingly draw a graphical interface that allow researchers to analyze models specifically.

4. FINDINGS AND DISCUSSION

4.1 Construct validity

Table 1 demonstrates correlations and reliabilities of constructs used in the research. Attitude, subjective norm and perceived behavioral control are all positively related with behavioral intention. Furthermore, right directions are observed in all correlations between behavioral beliefs and attitude, normative beliefs and subjective norm, control beliefs and perceived behavioral control. The Cronbach's alpha (Cronbach, 1951) was examined through a reliability analysis to determine the internal consistency for overall and individual constructs. According to Nunnally (1978), the threshold for an acceptable index of Cronbach reliability is 0.7, and on this basis, the higher value the scale is, the more reliable it is. In this case, the Cronbach's alpha of the total scale was 0.904.

Table 1. Correlations and reliabilities of constructs

Constructs	1	2	3	4	5	6	7
1.Behavioral beliefs	[0.94]						
2.Normative beliefs	0.30**	[0.74]					
3.Control beliefs	0.14*	-0.03	[0.56]				
4.Attitude	0.64**	0.45**	0.02	[0.87]			
5.Subjective norm	0.13	0.26**	-0.11	0.34**	[0.50]		
6.Perceived behavioral control	0.06	0.10	0.28**	0.04	-0.07	[0.30]	
7.Behavioral intention	0.65**	0.51**	0.07	0.60**	0.20**	0.07	[0.69]

**p<0.01 and *p<0.05

Reliability coefficients of the respective constructs are shown in brackets.

Factor analysis was conducted by using principal component and Varimax rotation methods in order to observe the distinction of each construct, from BBs to behavioral intention. In addition, the extracted number of factors was deliberately set as 7. The Kaiser-Meyer-Olkin (KMO) index obtained was 0.888 while 0.60 was recommended, indicating a high adequacy of the sampling data for performing factor analysis (Garson, 2001). As it is shown below in Table 2, the Barlett Test of Sphericity was 4004.686 with a significance of 0.000 and the cumulative percentage of variance of components was 65.17%. A few deficiencies of construct discriminating were expected since the research was explorative.

4.2 Result of structural equation modelling

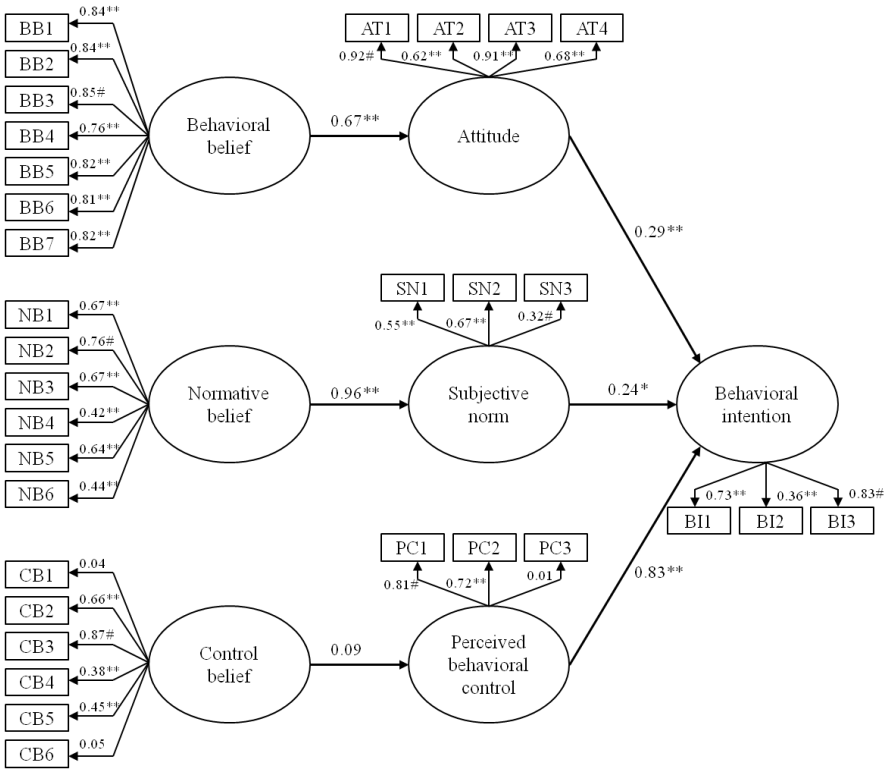
SEM was utilized to investigate the relationships between the criterion variable of behavioral intention and the respective predictor variables of attitude, subjective norm, and perceived control. Figure 4 displays the structural model parameters and summarizes the degree to which the data fit the model. Three standard indices, goodness-of-fit (GFI), adjusted goodness-of-fit (AGFI) and root mean square error of approximation (RMSEA), were taken use of to evaluate the fit between the structural model and data. The GFI estimates the amount of variance explained by the model, and the AGFI adjusts this estimate by considering the degrees of freedom. Both estimates can vary from 0 to 1, and the higher the value is, the better the model fits the data. The RMSEA index additionally compensates for sample size, with low values indicating a good fit. Some studies have suggested 0.10 as a cut-off for poor fitting models (Kenny, 2015). The three standard indices indicated an acceptable fit for the model of this study (GFI = 0.726, AGFI = 0.682, RMSEA = 0.094).

Table 2. Factor analysis of the measuring instrument

Scale items	Factor loadings	Eigen value	% of variance	Cumulative %
Behavioral belief		5.217	16.302	16.302
Family environment	0.675			
Community environment	0.806			
Municipal environment	0.826			
Life quality	0.587			
Family education	0.839			
Good habit	0.813			
Benefit municipal waste sorting	0.671			
Behavioral intention		4.026	12.581	28.883
Have intention to participate	0.647			
Have a detailed plan	0.717			
Motivate family members	0.655			
Normative belief		3.124	9.763	38.646
Listen to family	0.694			
Listen to community	0.544			
Listen to friends	0.783			
Follow most citizens	0.660			
Conform to regulation	0.499			
Influenced by reward and punishment system	0.755			
Attitude		3.109	9.717	48.363
Meaningful for families	0.551			
Important for families	0.800			
Meaningful for society	0.542			
Important for society	0.800			
Control belief		2.680	8.374	56.737
Time-consuming	0.424			
Garbage bag provision	0.631			
Knowledge provision	0.652			
Products easy to disassemble and sort	0.601			
Family cooperation	0.550			
Enough space	0.572			
Subjective norm		1.752	5.475	62.212
Agree/disagree with waste sorting	0.606			
Should/should not sort waste	0.709			
Encouraged by new regulation	0.548			
Perceived behavioral control		1.396	4.362	66.574
Family able to sort waste	0.684			
Personal ability	0.731			
Convenience	0.834			
Total scale reliability	0.904			

KMO=0.888

Bartlett's Test of Sphericity = 4004.686 at df = 496 with a significance of 0.000.



GFI=0.726 Adjusted GFI=0.682 RMSEA=0.094 # Value fixed at 1.0 *p<0.01 **p<0.001

BB1=Family environment
BB2=Community environment
BB3=Municipal environment
BB4=Life quality
BB5=Family education
BB6=Good habit
SN1=Agree/disagree with waste separation
SN2=Should/should not sort waste
SN3=Encouraged by new regulation
CB1=Time-consuming
CB2=Garbage bag provision
CB3=Knowledge provision
CB4=Products easy to disassemble and sort
CB5=Family cooperation
CB6=Enough space
NB1=Listen to family
NB2=Listen to community
NB3=Listen to friends
NB4=Follow most citizens
NB5=Conform to regulation
NB6=Influenced by reward and punishment system
BT1=Have intention to participate
BT2=Have a detailed plan
BT3=Motivate family members
PBC1=Family able to sort waste
PBC2=Personal ability
PBC3=Convenience

Figure 4. Structural equation model of waste separation behavioral intention

4.3 Discussion on the analysis result

Several findings were extracted from the analysis result. Among the three factors influencing the intention formation, citizens' attitude towards waste separation supports a formation of the intention, but the relation is weak ($b = 0.29$, $p<0.001$), which confirms the previous observation that people hold good attitudes, but do not perform de facto actions of separating waste. It also indicates that instead of good attitudes, there are other factors which form the separating waste behavior intention more significantly and directly.

Subjective norm has, but little, influence on the intention ($b = 0.24$, $p<0.01$), which indicates that citizens' social relations such as family members, neighborhood, and friends do not exert a strong impact on the

waste separation behavior. This may be attributed to individualism. Though Chinese culture is regarded as a collective culture, features of individualism can usually be observed, especially regarding young people. A likely reason is that China's one-child policy strengthened the consciousness of individuals. In addition, since reform and opening-up policies have been implemented, the value of individuals has been emphasized in a more open and market-oriented society. Another explanation is that the social atmosphere of separating waste has not formed yet, so that not much social pressure is felt by people who do not perform sorting behavior.

Different from the above two factors, PBC exerts a much stronger impact on the intention to separate waste ($b = 0.83$, $p<0.001$). Thus, certain constraints could diminish such an intention to sort household waste. Those constraints were mostly related to the perception of family and personal capability and convenience to sort waste. Additionally, an especially weak correlation between CB (which is supposed to form PBC) and PBC ($b = 0.09$) stands out. Two assumed explanations are: 1. Questions in CB are not sufficient for PBC, as other ability enhancement methods such as education in schools and companies were not included in the questions. 2. Citizens have a concept of waste separation (as Hangzhou started the waste separation program early in 2000), which may lead to a misperception that they have already mastered how to sort waste, but actually they do not have an explicit understanding.

5. POLICY IMPLICATION AND CONCLUSION

Results of this study demonstrate the partial utility of TPB as a conceptual framework for analyzing the behavioral intention of sorting household waste among Hangzhou citizens. The various GFI indices (GFI, AGFI and RMSEA) indicated that the result is acceptable, but not satisfactory, meaning that there may be more variables influencing the behavioral intention. Thus, a further and more comprehensive study will be developed in the next stage of research. Currently, findings show that all the three factors, i.e. attitude, subjective norm and perceived behavioral control had direct impacts on behavioral intention. However, among them, only perceived behavioral control showed a strong correlation with behavioral intention.

Based on the findings of the study, a number of implications and applicable policy proposals for the municipal government can be obtained. Under the circumstance that the waste transportation system and sorted waste disposal ability will be improved, the government should focus on enhancing citizens' PBC, that is, to convince people of their own capability towards household waste separation. Despite brochure distribution and on-site instruction being utilized to teach residents how to sort waste, brochures in some communities were difficult to understand due to tedious and small-word instructions. Easy-to-understand illustrations such as anime characters and dialogs would be more attractive and instructive especially for children and the elderly. As for on-site instructions, quite a lot of survey respondents reflected that those instructions were rarely provided in most communities, for some, such instructions were never conducted. As on-site instruction is a most direct and effective method, popularizing waste separation training programs in communities would enhance residents' capability of waste separation and improve their awareness of how easy it is. To prevent people from worrying about any possible inconvenience during the process of waste separation, the government should be aiming at notifying residents of

categories to which different waste items belong, as clearly and detailed as possible. In addition, food and other consumption companies are responsible for developing technologies in terms of packing and product constructs, or introducing that from others which have already been developed. Other measures to strengthen PBC include putting more public service advertisements in mass media, supporting schools and companies to organize field trips in waste management facilities, and so on. While taking use of mass media to promote waste separation campaigns, plots relevant to waste separation could be added into movies or televised dramas as well, to raise people's consciousness. Such plots can often be seen in Japanese movies and TV dramas. On the one hand, waste separation has already become a part of a Japanese national's daily life, on the other hand, it deepens people's consciousness of waste separation to help reinforce there already established habits.

From the perspective of improving citizens' subjective norm, promoting waste separation campaigns from more various ways is considered as essential. Currently, not only the government, but many local volunteer groups, NGOs, and education institutions are involved in waste separation campaigns (Hangzhou Daily, 2014; Hangzhou Volunteer, 2014). As civilian power takes a significant role in such campaigns, the government should support those non-governmental social organizations. Promoting school education can not only enhance children's knowledge, as mentioned above, but also help to spread the idea of waste separation, as those educated children are able to influence their parents' minds positively.

On the other hand, citizens need to perceive correctly their actual capability of waste separation and achieve a paradigm shift from “none of my business” towards “it’s my duty”. To that end, schools and children, local volunteer groups and organizations should play main roles as models to lead the campaign. Only by combining both the governments’ and citizens’ efforts, can the waste separation system be enhanced and reach the expectations.

Limitations of the study included the online survey as a research method; even though the respondents’ profile was close to a normal distribution, people who do not often use internet such as the elderly may have been excluded from the research. In addition, future studies may investigate the power of current policy and regulations on household waste separation.

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