ATLANTIS
PRESS

Reversed Logistics:
Assessing Packaging Recycling Behavior Based on TPB Theory

Kedong Liu[1],[*] Ruoyu Zhang[2]

[1]*Jimei University*
[2]*Macau University of Science and Technology*
[*]*Corresponding author. Email: lkdkendo@163.com*

ABSTRACT

The current system of delivery not only places a heavy burden on waste disposal in society but also causes environmental pollution and a waste of resources in China. package sorting and recycling have become one of the most effective solutions This study aims to examine the factors affecting people's behavior intention of packaging classification and recycling based on the theory of planned behavior, as well as description norms on behavioral intention. Further, according to the spillover effect, these factors of people with different attitudes towards garbage classification on packaging classification and recycling behavior intention are also examined. The results show that people's attitude, subjective norms, perceived behavioral control, perceived usefulness, and description norms all significantly predict people's intention on classification and recycling of packaging. In addition, the effects of these factors among people with different levels of attitude towards garbage sorting has been compared and discussed.

Keywords: package sorting and recycling, Theory of Planned Behavior, spillover effect

1. INTRODUCTION

As the world's internet e-commerce continues to expand and logistics capabilities are developed, increasing numbers of people are doing their shopping online. Thus, the daily load of logistics packages is also increasing, resulting in a large number of abandoned express packages. According to statistics, the average daily volume of China's logistics business exceeds 240 million pieces. It is estimated that China's express delivery industry consumes more than 9 million tons of paper waste and 1.8 million tons of plastic waste every year. Based on the industry standard of 0.2 kg per package, China's express delivery generated more than 16 million tons of solid waste in 2020 (State Post Bureau, 2020). According to research, the pollution caused by packaging waste has become the fourth largest source of pollution in China after water pollution, lake and sea pollution and air pollution [1]. Processing of used logistics packaging, protection of the environment and promotion of sustainable economic development have become desirable goals for all the world's countries. The current system of delivery not only places a heavy burden on waste disposal in society but also causes environmental pollution and a waste of resources. At the intersection of these two problems, it is necessary to pay

attention to the sorting and recycling of logistics packaging. Therefore, based on the theory of planned behavior (TPB), this study discusses the factors that affect people's behavioral intention of garbage sorting and recycling, hoping to provide some reference values for future research.

TPB is one of the best-known theories of behavioral determinants [2]. It assumes that individuals' behavior is shaped by their attitudes, subjective norms, and perceived behavioral control. Therefore, this study also combines perceived usefulness and description norms to study how they affect the behavior of classified recycling packaging.

2. LITERATURE REVIEW

Ajzen (1991) developed TPB to understand the psychological basis of volitional behavior. TPB puts forward three key antecedents of behavioral intention: attitude, subjective norms and perceived behavioral control. It assumes that behavioral intent is a good proxy for actual behavior, as researchers have verified [3].

2.1 The Variables of TPB

Attitude. Attitude is the positive or negative psychological tendency of an individual toward a particular behavior. This hypothesis has been proved by

experiments [4]. In addition, many studies show that the attitude toward garbage recycling can be used as a very powerful variable to predict garbage recycling behavior [5], and can also be applied to packaging recycling behavior. Therefore, we derive Hypothesis 1:

H1. Attitudes toward package sorting and recycling are positively related to package sorting and recycling intention.

Subjective Norms. In addition to personal attitudes, social norms are also an important factor influencing people's behavior. This is especially the case for those who fear social exclusion, who are prompted to take action by reference to subjective norms [6] because people in this social group are easily influenced by group views. Subjective norms highlight individuals' beliefs about how significant their actions are expected to be by those they think are important. As a result, based on this concept, we made the following hypothesis:

H2. Subjective norms about sorting and recycling packages should positively influence online purchasing behavior.

Perceived Behavior Control. Behavioral intention is not only influenced by individual attitudes and social norms but is also influenced by the degree of ease or difficulty that an individual perceives the performance of a particular behavior, which is the judgment of an individual's ability to perform behavior [7]. The research of garbage classification and recycling behavior points out that perceptual behavior control is an effective index to predict garbage classification and recycling behavior. If a person has the ability to participate in sorting and recycling packaging, their willingness to do so will be strong. Therefore:

H3. Perceived behavioral control should positively influence packaging sorting and recycling behavior.

Perceived usefulness. At the same time, based on Chen's influence of perceived green usefulness on behavior [8], this study uses perceived green usefulness as a variable to investigate garbage classification and recycling behavior. Some previous investigations have used TPB to explore problems in this field, such as behavioral intention of campus recycling [9].

H5. Perceived usefulness should positively influence behavior intention toward packages sorting and recycling.

Descriptive norms. In the previous literature, some studies have questioned how, when combining descriptive norms with TPB theory, descriptive norms affect intention [10]. Therefore, this study adopts the same method to explore how descriptive norms affect the behavior intention of packaging classification and recycling. Descriptive norms have special significance for people's behavior towards packaging materials in the context of recycling, which can occur in the decision-making process of a social group or a friendship group

(for example, a class in school or a work group), and these social networks can be applied to this aspect. Previous research has found that knowing someone who has a particular behavior, especially a family member or friend, increases the likelihood that the individual will engage in that behavior in the future [11]. Therefore, descriptive specifications can be used as another factor of packaging classification and recycling behavior. So, we can make this assumption:

H6. Descriptive norms will have a positive impact on people's packaging classification and recycling behavior intention.

2.2 Attitudes towards garbage sorting

A previous paper found that the attitude towards genetically modified food technology has a certain influence on the decision-making towards new food technology which is known as spillover effects [12]. This paper applies the same idea to study people with different concepts of garbage classification whose concepts of packaging classification and recycling are also different.

RQ1. Does the attitude towards package sorting and recycling differ among people with different pre-existing attitudes towards garbage sorting?

3. METHOD

3.1 Data and samples

We hired a market research company, called Credamo, to use the internet to conduct online questionnaires. The data were collected from 30 January 2022 to 10 February 2022. After completing the questionnaire, participants were rewarded by being paid 1.2 to 1.5 yuan. A total of 652 copies of the questionnaire were recovered. After deleting returns with missing variable data, the actual number of valid samples in this paper was 633. All items were measured on a 7-point, Likert-type scale ranging from "strongly disagree" to "strongly agree".

The sampling is a convenience sampling, including basic information about gender, age, education level and full-time job, with participants being selected nationwide to participate in the survey. Of the 633 respondents, 46% were male and 54% were female. The median age of the participants was 35 years (M = 31.2, SD = 9.15). In terms of education level, 83% of the participants had a bachelor's degree (including junior college) or above, and 17% had a bachelor's degree (including junior college) or below. Among them, bachelor's degrees accounted for the highest proportion.

3.2 Preliminary Analysis

Before the regression analysis, we screened the missing data, conducted descriptive statistical analysis on each variable after deleting it from the total sample and

calculated the reliability of each variable.

Attitude towards package and garbage resorting. Four items measured respondents' attitude towards package and garbage resorting, followed by four-word pairs in a 7-point semantic differential scale: "harmful – beneficial", "blameworthy –praiseworthy", "bad – good", "unethical – ethical" (M=5.665 and 5.718, SD=1,454 and 1.429, Alpha α= 0.853 and 0.835, respectively).

Perceived useless. Three items were used to measure whether the respondents felt that packaging recycling was useful (M=5.684, SD=1.236, Alpha α=0.817).

Subjective norms. This study used three items to measure respondents' subject norms (M=5.484, SD=1.183, Alpha α=0.875).

Perceived behavioral control. five statements were presented and were followed by word or sentence pairs rated in a 7-point semantic differential scale (M=5.503, SD=1.146, Alpha α=0.835).

Descriptive norm. Four items measured how influenced respondents were by the actions of those around them (M=5.235, SD=1.345, Alpha α=0.889).

Behavioral intention. Four items measured respondents' intentions to engage in garbage sorting behavior. Respondents indicated whether they agreed with the classification of packaging regarding their intentions (M=5.557, SD=1.241, Alpha α=0.896).

4. RESULT

Regarding the research on the influencing factors of sorting and recycling packages, many scholars use ordinary least squares (OLS) regression analysis [13]. The least squares method is also used for regression analysis. After returning to the behavior intention of sorting and recycling packages, the results are as follows (Table 1).

Table 1. Regression results

	Variable	Behavior intention	
		Coefficient	T value
Control variable	Gender	-.038**	-2.003
	Education level	.018	.898
	Attitude	.094***	3.710
Independent variable	Perceived usefulness	.134***	3.846
	Subjective norms	.083**	2.501
	Perceived behavioral control	.262***	8.329
	Description norms	.231***	7.878
C			.089

Note a: ***, **, * indicate significance levels of 1%, 5%, and 10%, respectively.

From the perspective of coefficients, the coefficients of attitude on behavior intention are 0.094, which are both positive and significant. There is a significant positive correlation between the attitude of sorting and recycling packages and the behavior intention of sorting and recycling packages, and the improvement of personal attitude will be beneficial to the classification and recycling of packages. That is, when individuals have a higher attitude level of packaging sorting and recycling, it is helpful to realize such behavior.

The subjective norms are positive for the behavior intention. When people who are important to me think, I am going to sort and recycle packages, personal behavior is more inclined to carry out package sorting and recycling. Similarly, the coefficients of description norms

are 0.231, just like the subjective norms, and have a significant positive effect on the behavioral intention of package sorting and recycling and a greater impact than the subjective norms. The same is true for perceived behavioral control, which has a significant positive correlation with behaviors. As the leading variables of the influence attitude, perceived usefulness whose coefficients are 0.134, show a positive correlation.

In addition, this paper divides people's views on garbage sorting into two groups by median (6.25) for regression analysis, as shown in Table 2 below. Classification is based on the median of all data (M=6.25), with one group greater than 6.25 and the other less than 6.

Table 2. Attitude grouping.

	Variable	Behavior intention			
		Coefficient		T value	
		Attitude>6.25	Attitude<6.25	Attitude>6.25	Attitude<6.25
Control	Gender	-.072**	-.018	-1.997	-.565
	Education level	.001	.016	.039	.479
	Attitude	.158***	-.003	3.734	-.073

Independent	Perceived	-.078*	.216***	-1.727	3.657
	Subjective norms	.308***	.037	5.466	.661
variable	Perceived	.337***	.195***	7.746	3.750
	Descriptive	.161***	.298***	3.321	6.236
C				1.061	.077

Note a: ***, **, * indicate significance levels at 1%, 5%, and 10%, respectively.

Through the comparison of the above two tables, their age and education level show the same trend with their behavior, showing negative correlation and positive correlation, respectively. It should be noted that the coefficients of most variables in the M>6.25 group (including subject norms, perceived behavioral control, and description norms) were smaller than those in the M<6.25 group, showing a more significant positive correlation with behavior. For the attitude of packaging classification and recycling, the coefficient of the M>6.25 group was larger than that of the M<6.25 group (0.158 and -0.003, respectively). Perceived usefulness is also significantly different. In the group of M>6.25, it is negatively correlated with the behavioral intention of packaging classification and recycling (-0.078), while in the group of M<6.25, it is opposite (0.216).

5. CONCLUSION

First of all, people's attitude towards packaging sorting and recycling plays an important role in promoting the intention of carrying out this behavior. Attitude has a significant and positive impact on garbage classification intention. Second, our study highlights the importance of subjective norms, perceived behavioral control and descriptive norms. Lastly, we conducted a group test for people with different attitudes towards garbage classification and found that the higher people's attitude on garbage sorting, the more their attitude on packaging sorting and recycling affected their intention.

To sum up, it is suggested that decision-makers can consider improving people's intention about sorting and recycling packages by raising their attitude about sorting and recycling packages. Finally, it is necessary to better understand the socio-psychological factors affecting urban residents in practical applications and formulate a more detailed and scientific garbage classification guidance method.

REFERENCES

[1] Zhang, G., & Zhao, Z. (2012). Green packaging management of logistics enterprises. *Physics Procedia*, *24*, 900-905.

[2] Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. doi:10.1016/0749-5978(91)90020-T

[3] Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behavior. In D. Albarracin, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 173–221). Mahwah, NJ: Erlbaum.

[4] Yang, X., Chen, L., Wei, L., & Su, Q. (2020). Personal and media factors related to citizens' pro-environmental behavioral intention against haze in China: A moderating analysis of TPB. *International Journal of Environmental Research and Public Health*, *17*(7), 2314.

[5] Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*(6), 1015.

[6] Bandura, A. (2002). Social cognitive theory in cultural context. *Applied Psychology*, *51*(2), 269-290.

[7] Maichum, K., Parichatnon, S., & Peng, K. C. (2016). Application of the extended theory of planned behavior model to investigate purchase intention of green products among Thai consumers.

[8] Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*(6), 1015.

[9] Largo-Wight, E., Bian, H., & Lange, L. (2012). An empirical test of an expanded version of the theory of planned behavior in predicting recycling behavior on campus. *American Journal of Health Education*, *43*(2), 66-73.

[10] Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behavior: A meta-analysis. *Current Psychology*, *22*(3), 218-233.

[11] Robinson, N. G., Masser, B. M., White, K. M., Hyde, M. K., & Terry, D. J. (2008). Predicting intentions to donate blood among nondonors in Australia: An extended theory of planned behavior. *Transfusion*, *48*(12), 2559-2567.

[12] Ho, S. S., Goh, T. J., Chuah, A. S., Leung, Y. W., Bekalu, M. A., & Viswanath, K. (2020). Past debates, fresh impact on nano-enabled food: A multigroup comparison of presumed media influence model based on spillover effects of attitude toward

genetically modified food. *Journal of Communication*, *70*(4), 598-621.

[13] Yang, X., Chen, L., Wei, L., & Su, Q. (2020). Personal and media factors related to citizens' pro-environmental behavioral intention against haze in China: A moderating analysis of TPB. *International Journal of Environmental Research and Public Health*, *17*(7), 2314.