RESEARCH ON FACTORS TO PROMOTE RETURNING USED CARTON TO ACHIEVE REVERSE LOGISTICS AMONG UNIVERSITY STUDENTS

Tang Ying[1], Wu Zhaohui[2], Sun Jian[3]

[1]*(College of Tourism, University Baise, China)*
[2]*(College of Tourism, University Baise,China)*
[3]*(GuangDongUniversity of Petrochemical Technology,Guangdong, China)*

Abstract: *The study investigates on activities of returning the usage cartons among university students through online shopping based on reverse logistics in China. Online shopping is the most popular transaction at present which reduces time, costs and have multiple choices with cheaper products. Most of the sellers use the designed cartons in their packaging. The buyers normally discard the cartons and some keep the boxes but are not reused. Those discarding activities are worrying and cause environment and health impacts, and occupy unnecessary space. This study focuses on ways to improve the rate of recycling cartons in perspective of customer psychology. The framework of this study is underpinned by Theory of planned behavior (TPB) which is affected by attitude, subjective norms, and Perceived Behavioral Control (PBC). The study employed regression to test the hypotheses, and all variables have significant relationship with the intention of returning on paper wasted boxes from online shopping.*

Keywords: *on-line shopping, reverse logistics, used carton, online shopping, theory of planned behavior.*

INTRODUCTION

Information Technology has reformed the business world by connecting all the people and things around the world. Consequently, the online shopping activities upon IT developed dramatically. The same situation happens in China. In China, the total population (2024) is approximately 1.4 Billion, with the penetration rates on online shopping reaching88.3%. The estimated amount of online shopping in 2023 amounting to CNY 15.4 Trillion (CNNIC, 2024), and the volume is increasing 8.4 % in 2023 (CNNIC, 2024). With the growth of the express delivery business, the derived express packaging garbage, including carton, raw papers, and plastics, is growing. According Du Huanzheng (2021), the express service industry will occur 9.8 million tons used carton garbage. However, the actual recycling rate of carton (cardboard) is only less than 50% (Du Huanzheng, 2021). Thus, it seems that to improve the recycle rate of carton can restrain the packaging garbage pollution. Meanwhile if one ton of waste cartons can be recycled, the felling of 16.6 trees is reduced; 417 kg of air pollutants will be reduced; 588.56kilowatt-hour electricity will be saved, 2.26 cubic meters of landfill space will be saved (Gao Ying 2018). Thus, improving the recycle rate of carton can protect environment excellently. In addition, if the used expressed carton can be recycled and re-used in the next time courier activities, the expressed companies and the customers should not need to purchase the new carton. In that manner, it also can save huge cost in the whole express industry. Therefore, the recycling of express cartons is beneficial not only to whole environment but also to whole express industry. Consequently, there is an urgent need to achieve recycling carton.

For solving the problem of returning the used carton at present, the reverse logistics activity should be adopted. In the past decades, many studies have been conducted in multiple aspects on general reverse logistics implementation and methodology, such as forecasting on the return products (Xiong et al., 2011), factors that influence the adoption of reverse logistics activity (Luo Jie, 2006), barriers to reverse logistics activity (Jindal and Sangwan, 2011), value return material (Fan Guicai, 2013), designing reverse logistics network for optimal collection (transportation routes) (Kui Mingming, 2009), management between two competitive closed-loop supply chains (Das & Chowdhury, 2012), the usage of information and communication technology (ICT) (Omotayo and Melan, 2017). Although the research on reverse logistics is increasing, most of those previous studies are concentrated on the issues that arise from the company or organizational perspective. Therefore, most of the solutions and results from the studies only serve the companies and organizations. However, in terms of the reverse logistics discussion, literature related to individual customers is still very low and rare (Dixit & Badgaiyan, 2016).

That individual customers directly return their express cartons to the express service centers should be considered as the first step in the reverse logistics. Meanwhile it also can effectively re-use those used cartons, since this manner can prevent those cartons from contaminating by household garbage in the recycle bins. To achieving the effective reverse

logistics activities in high quality, the rate of retuning carton should be increased. Thus, the study on improving the rate of returning the paper-box activities from individual customers is significant. Therefore, the development and testing of a comprehensive framework is therefore necessary to enhance the rate of carton return activities by promoting consumers' intention to return carton from online shopping.

FRAMEWORK ON INTENTION TOWARDS RETURNING THE USED CARTON FROM ONLINE SHOPPING
In developing an in-depth understanding of consumers' intention toward returning the carton from online shopping, a framework (Figure 1) was built up based on previous research on intention of recycling behavior. The core construct of the framework underpins the theory of planning behavior by Ajzen (1991). Ajzen (1991) holds that TPB is the theory which refers to the intention to predict individual action behavior. There are three elements to affect the intention in TPB, which are attitude, subjective norms and PBC. Meanwhile Ajzen (1991) also mentioned the TPB is free to apply in different studies, in order to match and explain accurately to the characteristics in different studies. Many studies have been conducted by underpinning TPB in different contexts (Aini et al., 2002; Sidique, Lupi, & Joshi, 2010; Latif & Omar, 2012; Wan et al., 2012; Ramayah et al., 2012; Botetzagias et al., 2014; Echegaray & Hansstein, 2017; Tang Ying & Wu, Zhaohui, 2023). Thus, it is reasonable that this study applies the TPB to examine the university students' intention on returning the carton in China.
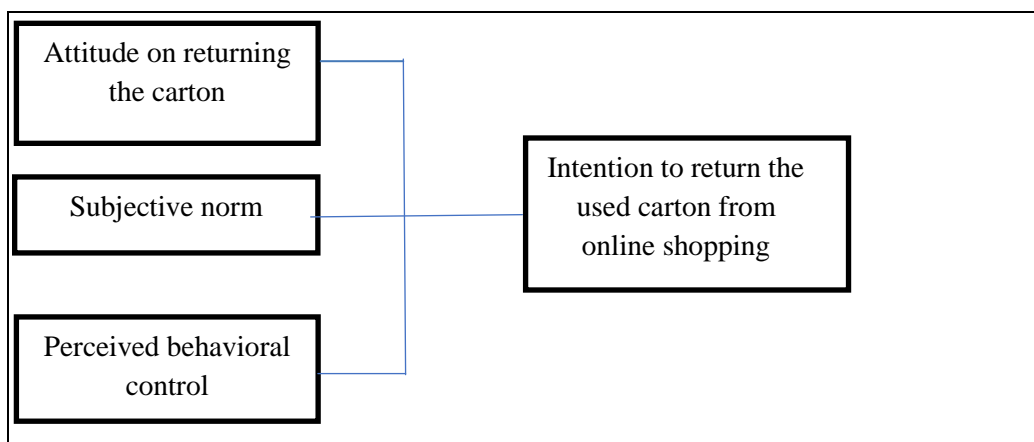

Figure 1. Research Framework

2.1 Intention on returning the used carton from on-line shopping
As discussed before, Returning the carton from on-line shopping are beneficial not only to whole environment but also to decrease the cost for the whole express industry. Consequently, this behavior relies on rational choice models, which includes TPB. In detail, it holds that intention is influenced by (1) individual attitude towards performing a particular behavior, (2) subjective norms the individual perceives, and (3) perceived behavioral control. The next section discusses on the relationship between these three factors and intention on returning the carton from online shopping.

2.2 Attitude toward returning the used carton
Attitude is referred as "good", "bad", "positive", "negative", "favorable" and "unfavorable" evaluation on consequences of performing the particular behavior (Chu and Chiu, 2013; Tang, Chen and Luo, 2011). Based on the literature reviews relating to pro-environmental behavior in the context of recycling behavior, there is evidence that positive attitude towards behavior may cause a positive intention towards the behavior in a high possibility level (Aini et al., 2002; Latif & Omar, 2012; Wan et al., 2012; Ramayah et al., 2012; Botetzagias et al., 2014; Echegaray & Hansstein, 2017). Therefore, the individual will perform the actual behavior if he or she has positive intention on that behavior. Thus, in this current study, if the individual has a positive attitude towards returning their used carton from online shopping, therefore, they are relatively to have the positive intention on returning their used carton. Thus, the hypothesis is:
H1: Attitude towards returning the used carton has a significant relationship with intention to return the used carton from online shopping

2.3 Subjective norm

According to Ajzen (1999), subjective norm related to social factors and social norms, and referred to the perceived social pressure by the individual to perform the specific behavior or vice versa. In TPB, subjective norm also can be considered as an important predictor on the behavioral intention. Normally, an individual will intend to perform the specific behavior when perceives that important referents (which includes family, friends, and peers) hope to perform the specific behavior (Conner & Armitage, 1998; Tang Z. et al., 2011; Moons & De Pelsmacker, 2015, Tang Ying, 2020). Therefore, TPB assumes that subjective norm is direct determinant towards the individual behavioral intention, which finally can affect the real behavior performed. There are many previous studies conducted on subjective norm that support this statement. For example, the studies relating to pro-environmental issues have indicated that there is positive and significant relationship between subjective norm and its behavioral intention (Conner & Armitage, 1998; Moons & De Pelsmacker, 2015). Thus, the hypothesis is:

H2: Subjective norm has a significant relationship with intention to return the used carton from online shopping.

2.4 Perceived Behavioral Control (PBC)

Perceived Behavioral Control (PBC) is an extended variable from TRA due to the issue of non-volitional control. In TPB, PBC, which is derived from control beliefs, reflects the actual non-volitional situation and condition in certain level (Ajzen, 1991), and the more accurately the individual can perceive on the actual situation, the more accurately the actual situation can reflect. Therefore, PBC can be considered as volitional power assessment on their non-volitional power (actual ability) to perform certain behavior. Ajzen (1991) holds that control beliefs, which is the antecedent of PBC, refers to the perceived probability on the situation which will may ease an individual on performing a particular behavior or vice versa. Besides control beliefs, Ajzen (1991) also hold that PBC will be determined by perceived power. Both "control beliefs" and "perceived power" collectively will positively affect the intention toward the behavior. Many empirical studies have proven that PBC has positive significant relationship with behavioral intention (Knussen C. et al., 2004; Tang Z. et al., 2011; Latif et al., 2012). Thus, the hypothesis is:

H3: Perceived behavior control has a significant relationship with Intention to return the used carton from online shopping.

3. Research Methodology

The survey conducted explores the intention of university students on returning used carton from online shopping in Guangxi, China. The questionnaires are used in the survey towards the intention and adapted from (Nduneseokwu, et al., 2017; Moons and De Pelsmacker, 2015; Khatimah, 2016), meanwhile the independent variables (attitude, subjective norms and PBC) are adapted from Chu and Chiu (2003). Therefore, the main data collection technique applied in this research is questionnaires. A seven-point Likert scale is used in this study to calculate the variables. The data will be analyzed by SPSS 24.0. A total of 411 questionnaires were distributed from 23rd September 2023 until 11st July 2024 in 24 public universities in Guangxi, China based on the Sampling Matrix (Israel, 1992). At the end, a total of 401(97.5%) questionnaires were valid and accepted for the analyses.

RESULT

4.1 Reliability Analysis

Reliability analysis is to ensure the accuracy and the precision of a given measurement to meet standard (Thorndike, Cunningham, Thorndike & Hagen, 1991). Based on Nunnally (1970), each evaluation criterion has fulfilled threshold (Coefficient Alpha>0.6) as shown in Table 1.

Table 1. Summary of Reliability Test

No.	Variables	Cronbach's Alpha	No. of Items	Item Deleted
1	Attitude	0.939	6	Nil
2	Subjective Norms	0.911	9	Nil
3	PBC	0.859	6	
4	Intention to return the used carton from online shopping	0.9909	6	Nil

4.2 Convergent Validity

By convergent validity test, it can be proved that the constructs are strongly interrelated (Brown, 2006). In this section, the exploratory factor analysis (EFA) is used to assess this validity to determine whether the items converge is satisfactory or contrary.

Table 2. KMO and Bartlett's Test for All Variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.884
Bartlett's Test of Sphericity	Approx. Chi-Square	9869.537
	Df	351
	Sig.	0.000

Table 2 shows the KMO and Bartlett's Test for all variables. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.878. Meanwhile in the Bartlett's Test of Sphericity, the significant value is approximately zero. Since the Kaiser-Meyer-Olkin Measure of Sampling Adequacy is higher than threshold, which is 0.5 and the significant value for the Bartlett's Test of Sphericity is lower than 0.05. Thus, the data is suitable for process factor analysis.

Table 3 shows that the value of factor loading on all items are higher than threshold, which is 0.3 (Hair et al, 2006). Thus, all the loading factors are accepted. Meanwhile all the loading factors are located at Component 1 to Component 5 separately, which means that the data should be separated into five groups. It indicates that the data should present five different variables. Thus, it matches the construct of current theory in this paper. Thus, the convergent validity test is passed. The further data analysis can be continued.

Table 3. Rotated Component Matrix[a] for All Variables

	Component			
	1	2	3	4
att1I think recycling express cartons is a good behaviour.	-.071	.912	.156	.142
att2I am very happy and pleasant to recycle the express carton. (including keeping the box clean and having the administrator to come to your door to recycle it.)	-.069	.833	.172	.136
att3I think it is very meaningful to recycle on express cartons.	-.057	.812	.103	.086
att4I think the recycling of express carton is helpful to reduce the environmental pollution.	.030	.804	-.039	.087
att5I think recycling express cartons may help to protect the natural environment.	-.061	.915	.161	.157
att6 I think express carton recycling may reduce the public costs.	-.010	.909	.069	.120
sn1My family has positive influence to recycle my waste cartons.	.913	-.086	.159	.005
sn2My friends have positive influence to recycle my waste cartons.	.890	-.073	.013	-.007
sn3My neighbors have positive influence to recycle my waste cartons.	.772	-.032	.290	.012
sn4My roommates have positive influence to recycle my waste cartons.	.724	.198	.040	.003
sn5Environmental organizations, or the communities, which I'm involved in, have a great positive impact to recycle my waste cartons.	.586	-.229	.129	-.031
sn6The government has positive influence to recycle my waste cartons.	.521	-.340	.347	-.150
sn7The school has positive influence to recycle my waste cartons.	.459	-.095	.626	-.209
sn8People (or organizations), who influence my decision, support(s) me in recycling cartons.	.679	-.193	.416	-.099
sn9People (or organizations), who are important to me, think(s) I should recycle my waste cartons.	.782	.078	.351	.083
pbc1I have time to recycle my waste cartons.	-.007	.115	.137	.831
pbc2Recycling my waste cartons is convenient.	-.160	.164	.319	.628
pbc3Returning the cartons would not cost me too much effort.	-.226	.228	.283	.642
pbc4Weather returning boxes or not is totally up to me.	.038	.078	.083	.820
pbc5I am able to control the amount of returning the cartons.	.075	.068	-.051	.760
pbc6I am not feeling shy to recycle the waste cartons.	.241	.222	.552	.634
itt1 I have intention to recycle the waste cartons from online shopping. (Including administrator of building comes to your door to recycle the carton, I will try not to get the carton dirty).	.278	.237	.739	.268
itt2 I am willing to recycle the boxes to the agencies of express companies soon. (behavioral).	.548	.372	.409	.129

itt3 I would like to participate in activities related to recycling cartons held by relevant organizations. (For example, Alibaba group carried out a "ROOKIE plan on returning to the box ".)	.484	.372	.543	.276
itt4 I would like to share the benefits of recycling cartons.	.227	.132	.834	.208
itt5 I am willing to encourage and persuade others people to join in recycling cartons. (Including not dirty the cartons to have the administrator of building to recycle.)	.304	.106	.684	.356
itt6 I will request administrator of building to help in recycling the express carton.	.207	.176	.793	.219

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

4.3 Discriminant Validity

Discriminant validity measures each distinct construct in the theoretical model (Byrne, 2010). Thus, it can infer that the constructs should not interrelate (Compeau, Higgins & Huff, 1999). In order to find out the relation effect of each construct, the discriminant validity in this study is calculated through the Pearson correlation values. Mayer (1999) suggests that moderately weak correlation of 0.2 to 0.8 can be accepted for any variables. Table 4 shows that all the Pearson Correlation is smaller than 0.8. Thus, all the constructs have passed the discriminant validity test.

Table 4. Pearson correlation among the variables

		att	sn	pbc	itt
att	Pearson Correlation	1	-.104[*]	.345[**]	.360[**]
	Sig. (2-tailed)		.037	.000	.000
	N	401	401	401	401
sn	Pearson Correlation	-.104[*]	1	.025	.573[**]
	Sig. (2-tailed)	.037		.613	.000
	N	401	401	401	401
pbc	Pearson Correlation	.345[**]	.025	1	.519[**]
	Sig. (2-tailed)	.000	.613		.000
	N	401	401	401	401
itt	Pearson Correlation	.360[**]	.573[**]	.519[**]	1
	Sig. (2-tailed)	.000	.000	.000	
	N	401	401	401	401

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

4.4 Regression Analysis

To determine whether the residuals are normally distributed, a normal Predicted Probability (P-P) plot was examined. Figure 2 shows the graph of Normal Predicted Probability (P-P) Plot of Regression Standardized Residual for IVs and DV. The graph can be seen conforming to the diagonal normality line indicated in the plot. Thus, the residuals are normally distributed.
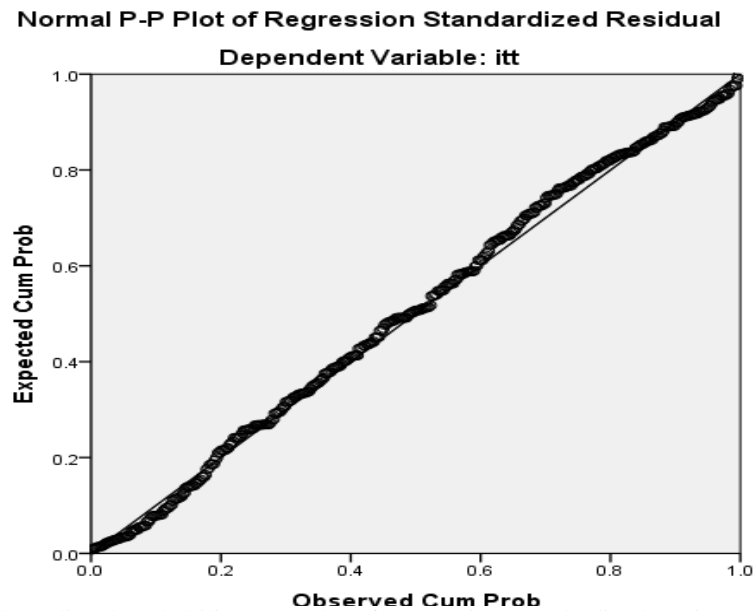
Normal P-P Plot of Regression Standardized Residual

Dependent Variable: itt

Figure 2. Normal Predicted Probability (P-P)Plot of Regression Standardized Residual for IVs and DV

Scatterplot
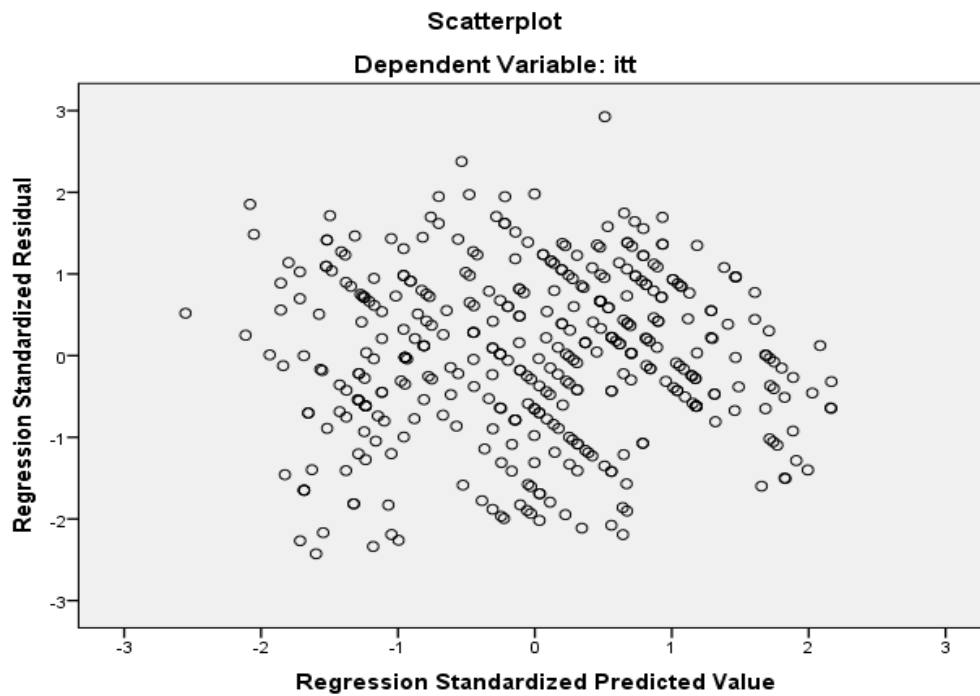
Dependent Variable: itt

Figure 3. Scatterplot for IVs and DV

The test for homoscedasticity (scatter plot of ZPred on ZResid), would reveal any variance of errors in analysis across all the levels in the predictor variables (Hair et al., 2006). Figure 3 shows that there is no obvious pattern for the scatter plots in the regression standard scatterplot between IVs and DV. Thus, there is no heteroscedasticity.

Statistics Solutions (2020) stated that when the residuals are normally distributed and homoscedastic, linearity should be accepted. Statistics Solutions (2020) stated that if VIF values for each value are below 10, the assumption of no Collinearity is met. Thus, Non-Multi-collinearity in this current model also should be accepted, since the result in Table 5 indicates that VIF for all values are lower than 10.

From Table 5 above, the significant value for att (attitude) is 0.000, which is lower than 0.05; meanwhile T value is 8.875, which is higher than 1.96, thus attitude toward returning used carton has a significant positive relationship with

return intention on used carton from online shopping. Furthermore, since the Unstandardized Coefficient B is 0.236, thus for every unit increase in att (attitude), itt (intention) will increase by 0.236 units, provided other variables, sn (subjective norms) and PBC remain unchanged.

Table 5: Coefficients[a] and collinearity for Hypotheses Test Among IVs and DV
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-1.391	.258		-5.398	.000		
	Att	.236	.027	.282	8.875	.000	.868	1.152
	Sn	.524	.026	.593	19.863	.000	.985	1.015
	Pbc	.579	.045	.406	12.852	.000	.877	1.140
a. Dependent Variable: itt,								

Table 6. Model Summary[b] for Hypothesis Test Among IVs and DV

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.808[a]	.652	.649	.50628	.884
a. Predictors: (Constant), pbc, sn, att					
b. Dependent Variable: itt					

Table 6 shows the model summary for hypothesis test among IVs and DV. The result shows that R-square value is 0.652. This means that 65.2% of the variation in itt (intention) can be explained by (or accounted for by) the variation in att (attitude) and sn (subjective norms), as well as PBC.

DISCUSSION AND IMPLICATION

This research provides the tests of a framework that may help scholars to understand the psychological factors which will affect intention to return the used carton from online shopping. This research uses the test for three factors from TPB, which are attitude, subjective norms and PBC. Although TPB claims that attitude, subjective norms and PBC will have positive effect to the intention on pro-environmental activities. Meanwhile, some researches have some inconsistent comments on attitude (Aini et al., 2002), subjective norms (Knussen et al., 2004) and PBC (Moons and De Pelsmacker, 2015). Among those factors, in different context, they will show different effects to customers' intention for pro-environmental activities.

In this study, all variables show significant relationships with intention to recycling carton from online boxes. Among the variables, PBC is the biggest predictor. Thus, improving the real situation for recycling process and the feeling on recycling situation is vital. Thus, authors suggest that (1) the limited resource should be invested on improving the recycling situation for example the operation center should build up the center near the main facilities (canteens or classrooms), and the universities should approve it, and (2) the governments and education system (universities) should may convince students that walking with carrying the carton to express operator center is not very far.

5.1Contribution

While a large number of customers in China frequently used online shopping, it leads to high waste on carton. Meanwhile the rate of recycling the used carton is very row, which makes a serious organizational cost, environmental problems, increasing landfill space and increasing social costs. In order to solve this problem, this research has developed and tested a coherent model that combined factors (attitude, subjective norms and perceived behavior control) which have been tested in different background studies. The findings of this study confirm that attitude, subjective norms and perceived behavior control have significant relationship with intention to recycling carton under the context of university students in Guangxi, China. The result of this study examined the variables has made further theoretical contribution by highlighting conceptual issues related to theory of planned behaviors (TPB) since TPB was inconsistent in various backgrounds of studies. Therefore, this study provides further theoretical understanding in TPB under the context of university students in Guangxi, China. Meanwhile, this study will help express operation centers and government universities in making more precise decisions regarding improvement rate of recycling carton from online shopping. This research has examined the

factors in the model and shown in the coefficients on different variables. The organizations should have priority to invest the real situation with the limited resource since PBC is the strongest predictor on intention to recycle carton.

5.2 Limitation

As with any conceptual model, this model also has its limitations. First, authors have set up a conceptual framework that includes psychological factors that are considered to drive customers to return carton from online shopping. Although the current framework is on a combination of results from many different studies relating to the pro-environmental activities, there can always be psychological factors, which can affect consumers' intention to perform pro-environmental activities, which are not included in the literature to date, or which is addressed in other literature studies. However, authors are confident that an overview of the most relevant factors in this context has been given. A second limitation of current paper is that this framework is the result of a literature review and only has been tested on university students in Guangxi, China. This implies that caution should be taken in applying this finding to other groups of people. Finally, the number of previous researches discussed in this paper, may be also limited.

Acknowledgments

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