Research on customers’ willingness to participate in express package recycling

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Abstract. The rapid development of logistics and electronics industry has produced a large number of express packaging garbage, which is gradually destroying the environment and wasting resources, the implementation of express packaging recycling has become the key, but consumer participation in express packaging recycling intention is not strong. Based on the theory of planned behavior, social exchange, perceived trust and situational factors, this paper constructs a model of influencing factors of consumers' willingness to participate in express packaging recycling, and makes an empirical analysis using structural equation model. The results show that recycling attitudes, perceived behavior control, perceived benefits, convenience and policy propaganda have a significant positive impact on consumers' willingness to participate in express packaging recycling. Subjective norms, perceived trust and perceived benefits have a certain impact on recycling attitudes.

1. Introduction
The development of Internet technology and logistics industry brings convenience to consumers, but also produces a large number of express packaging garbage. According to the latest data released by the State Post Office, the total volume of express delivery in China has been ranked first in the world for four consecutive years. Especially in 2017, 40.6 billion pieces of express delivery business have been completed, which means that at least 8 million tons of express packaging waste have been produced in the past year[1]. However, the recycling rate of express packaging garbage in China is less than 20%, and the recycling rate of paper packaging boxes is still less than 50%. A large number of express packaging garbage is gradually destroying the natural environment and wasting natural resources. The recycling of express packaging has become an urgent problem in China.

Many enterprises are carrying out green express delivery operations. However, express packaging recycling needs the participation of all members of the society, especially consumers, who are an important part in packaging recycling. Therefore, this paper studies the behavior of express packaging recycling, analyses the influence of various factors on this behavior, and effectively promotes the process of express packaging recycling, puts forward suggestions for the development of express packaging recycling enterprises.

2. Literature Review
2.1. Research on Consumer Recycling Behavior
In terms of the theory of planned behavior(TPB)[2], Yu F M[3] et al. found that attitude, subjective norms and perceived behavior control had a positive impact on behavior intention. Lu Y Y[4] et al. proved that past behavior habits, attitudes and behavioral control factors had a positive impact on
residents' recycling behavior, while subjective norms did not play a significant role in recycling behavior. Knussen et al. concluded that attitudes and perceived behavioral control played the most significant role in behavioral intentions, rather than subjective norms. Yushkova et al. found that attitudes, knowledge and social norms have a positive impact on mobile phone recycling intention. In terms of situational factors, Chen LF points out that situational factors are objective environmental factors that influence consumer behavior. Hu LM et al. argue that situational factors in e-waste recycling include recycling channels, policies, regulations and propaganda, and verify that situational factors effectively regulate the effect of behavioral intentions on behavior. They have not studied the situational factors' intention to recycle e-waste whether the direction has an impact. Wang ZH points out that recycling regulations and environmental policies have an important impact on recycling behavior.

2.2. Research on the Theory of Social Exchange and Perceived Trust
Social exchange theory is a social psychology theory founded by G.C. Holmans, a famous American sociologist in the 1960s. It advocates that all human social activities can be attributed to a kind of exchange. It holds that all human actions will be guided by obvious or indistinct exchange activities that can bring rewards or rewards. Sun NJ et al. believe that social exchange theory is a kind of “principle of reciprocity”. When any party in the relationship benefits in this process, it will have the psychological motivation to maintain the relationship and consciously complete the behavior of maintaining the relationship. Social exchange theory has been widely used in user behavior research, such as Huang et al. Based on social exchange theory, this paper studies online game players' willingness to continue using social networks. Atreyi regards knowledge sharing as a kind of social exchange behavior, and considers that factors affecting the use of electronic knowledge base can be divided into internal benefits and external benefits. Li JY believes that reciprocity and interest in social exchange will affect users' willingness to share knowledge in virtual communities.

Perceived trust is a belief that the other party will not do harm to one side's behavior. Perceived trust can reduce the perceived risk of consumers in carrying out certain activities, thereby enhancing behavioral propensity. Zhao DM et al. added the perceptual trust model to the study of consumers' online purchase intention, and verified that trust has an impact on purchase attitude, but has no effect on purchase intention.

In summary, all the studies have achieved good results on e-waste recycling behavior, but there are still some shortcomings. Firstly, the research on the willingness of express packaging recycling behavior has not been involved. Secondly, there are few studies on the introduction of social exchange theory and perceived trust into the recycling behavior. Therefore, this paper combines TPB with the theory of social exchange, perceived trust and situational factors to study consumer recycling willingness factors, for the implementation of express packaging recycling targeted and effective advice.

3. Research hypothesis and theoretical model

3.1. Hypothesis Based on Planned Behavior Theory (TPB)
TPB holds that attitudes, subjective norms and perceived behavioral control all have an impact on users' behavioral intentions. Attitude is a positive or negative evaluation of a particular behavior. Subjective norms refer to social pressures perceived by individuals from family members, friends or other groups, reflecting the impact of other groups or some important people on individual decision-making. Perceived behavioral control is an individual's perception of self-control ability in the execution of an action, or a judgment of whether or not he can complete the action. There is a greater uncertainty in the positive relationship between subjective norms and behavioral willingness. But subjective norms have a certain impact on behavioral attitudes. Therefore, it is assumed that:

H1: Recycling attitude has a positive impact on consumers' willingness to participate in express packaging recycling
H2: Perceptual behavior control has a positive impact on consumers' willingness to participate in express packaging recycling behavior

H3: Subjective norms have a positive impact on consumers' attitudes toward participating in express packaging recycling

3.2. Hypothesis Based on Social Exchange Theory

According to the theory of social exchange, people's active behavior can be regarded as a rational behavior to calculate personal interests, and to participate in certain behaviors based on certain interest factors. Social exchange comes from attraction, and economic motivation is the condition of social attraction. But the exchange relationship in social exchange theory is not only the relationship of material level, but also the exchange relationship of intangible or emotional level plays a decisive role. Express package recycling can be regarded as a kind of social exchange behavior. Through this behavior, consumers can get some valuable returns for them by handing the express package to the recycling enterprises for recycling, that is, perceived benefits, and motivate consumers to participate in the express package recycling. When participating in express package recycling, consumers will receive some economic incentives such as online purchase points or coupons given by some enterprises, or the environmental protection, achievement and pleasure of reducing waste of natural resources, which consumers themselves get through express package recycling, will even be appreciated by others. Consumers will choose to participate in express packaging recycling activities because of the stimulation and motivation of economic encouragement, sense of achievement and sense of pleasure. The following assumptions are made:

H4: Perceived benefits have a positive impact on consumers'attitudes toward participating in express packaging recycling

H5: Perceived benefits have a positive impact on consumers'willingness to participate in express packaging recycling

3.3. The Relationship between Perceived Trust and Consumers' Attitudes and Willingness to Participate in Express Packaging Recycling

Perceived trust embodies the consumer's belief in the reliability of the other party, believing that the other party will not do something risky to itself. In the process of express packaging recycling, trust is divided into consumer's trust to enterprise employees and enterprise's trust. There must be a certain degree of trust between consumers and leading enterprises in order to promote the smooth progress of express packaging recycling. Users will refuse to participate in all activities of the enterprise because they do not trust the leading enterprise. Express packaging recycling requires direct contact between consumers and employees, which requires consumers' trust in employees in order to promote the completion of both sides' behavior. Trust can make consumers believe that enterprises will not disclose their personal information when they recycle express packaging and can handle recyclable express packaging well. Therefore, the hypothesis will be put forward:

H6: Perceived trust has a positive impact on consumers' attitudes toward participating in express packaging recycling

H7: Perceived trust has a positive impact on consumers' willingness to participate in express packaging recycling

3.4. Relationship between Situational Factors and Consumers' Willingness to Participate in Express Packaging Recycling

Situational factors are the objective environment that individuals face when they perform a certain behavior. Situational factors are mainly divided into two categories: behavior-oriented and service-oriented. The service orientation includes service requirements, service convergence, service information, service mode and service facilities. The degree of convenience refers to the individual's behavior in such aspects as distance, difficulty in operation and so on. Consumers will reduce the
recycling behavior because of the distance from the recycling station. Policy propaganda refers to some policy support or regulation restrictions formulated by relevant departments on the recycling of express packaging and the propaganda and guidance of Internet media on the recycling of express packaging, so as to make more consumption. People understand, so as to improve consumer awareness of recycling. Therefore, the following assumptions are made:

H8: The degree of convenience has a positive impact on consumers’ willingness to participate in express packaging recycling

H9: Policy publicity has a positive impact on consumers’ willingness to participate in express packaging recycling

Based on the above analysis, this paper constructs a model of influencing factors of consumers’ willingness to participate in express packaging recycling, as shown in Figure 1:

![Figure 1. Theoretical Model of Consumers' Willingness in Express Packaging Recycling](image)

4. Methods

4.1. Data collection

This study collects data by means of questionnaire survey, in the form of online and offline. Likert scale was used to design the questionnaire. 405 questionnaires were recovered. After eliminating the invalid and logical confusion questionnaires, 375 valid questionnaires were obtained. The efficiency of the questionnaires was 92.6%. Final sample characteristics are shown in Table 1.

| Samples | Classification standard | Number | Proportion |
|---------|-------------------------|--------|------------|
| Gender  | Men                     | 156    | 41.60%     |
|         | Women                   | 219    | 58.40%     |
| Age     | Under 21 years old      | 39     | 10.40%     |
|         | 21-30 years old         | 294    | 78.40%     |
|         | 31-40 years old         | 26     | 6.93%      |
|         | Over 40 years old       | 16     | 4.27%      |
| Educational level | High school and below    | 38     | 10.13%     |
|         | Junior College          | 49     | 13.07%     |
|         | Undergraduate           | 210    | 56.00%     |
|         | Master and above        | 78     | 20.80%     |
| Occupation | Student               | 159    | 42.40%     |
|         | Enterprise personnel    | 111    | 29.60%     |
|         | Personnel of public     | 26     | 6.93%      |
|         | Others                  | 79     | 21.07%     |
| Average number of online purchases per month | 1-3 times | 214 | 57.07% |
|         | 4-6 times               | 100    | 26.66%     |
|         | More than 6 times       | 61     | 16.27%     |
4.2. Statistical analysis

Reliability reflects the consistency of the results of different measurements of similar or identical phenomena. The results of the analysis are shown in Table 2, from which we can see that the composite reliability (CR) of each variable is also greater than 0.7, which shows that the intrinsic quality of the model is good. The average variance extracted (AVE) of the model is greater than 0.5, indicating that the aggregation validity of the measurement model is better.

Table 2. The Reliability and validity of questionnaire

| Variable               | Measurement query | Factor loading | Cronbach's Alpha | CR   | AVE  |
|------------------------|-------------------|----------------|------------------|------|------|
| Perceived trust        | PT1               | 0.661          |                  |      |      |
|                        | PT2               | 0.773          |                  | 0.750| 0.605|
| Perceived benefits     | PM1               | 0.746          |                  |      |      |
|                        | PM2               | 0.739          |                  | 0.872| 0.578|
|                        | PM3               | 0.794          |                  | 0.804|      |
| Recovery attitude      | AT1               | 0.879          |                  |      |      |
|                        | AT2               | 0.876          |                  | 0.843| 0.519|
|                        | AT3               | 0.723          |                  | 0.794|      |
|                        | AT4               | 0.723          |                  | 0.794|      |
|                        | AT5               | 0.678          |                  | 0.794|      |
| Subjective norm        | SN1               | 0.782          |                  | 0.737| 0.584|
|                        | SN2               | 0.746          |                  | 0.737| 0.584|
| Perceptual behavior    | PBC1              | 0.879          |                  |      |      |
| behavior control       | PBC2              | 0.876          |                  | 0.843| 0.519|
|                        | PBC3              | 0.723          |                  | 0.794|      |
| The degree of          | DC1               | 0.723          |                  | 0.794|      |
| convenience            | DC2               | 0.723          |                  | 0.794|      |
|                        | DC3               | 0.723          |                  | 0.794|      |
| Policy publicity        | PA1               | 0.782          |                  | 0.737| 0.584|
|                        | PA2               | 0.746          |                  | 0.737| 0.584|
|                        | PA3               | 0.746          |                  | 0.737| 0.584|
| Recycling willingness  | BT1               | 0.711          |                  |      |      |
|                        | BT2               | 0.736          |                  |      |      |
|                        | BT3               | 0.736          |                  |      |      |
|                        | BT4               | 0.736          |                  |      |      |
|                        | BT5               | 0.736          |                  |      |      |

The fitting index results of the model are shown in Table 3. CFI and IFI are greater than 0.9, RMSEA is less than 0.08, which shows that the model is acceptable. Thus, the overall fitting index is ideal, and the structural model is more reasonable.

Table 3. Structural Equation Model Fitting Index

| Index | $/df$ | GFI | CFI | PGFI | IFI | RMSEA |
|-------|-------|-----|-----|------|-----|-------|
| Acceptable criteria CC criteria | $\leq 3.00$ | $>0.800$ | $>0.900$ | $>0.500$ | $>0.900$ | $<0.080$ |
| Results | 2.894 | 0.862 | 0.915 | 0.683 | 0.916 | 0.071 |

The results of path analysis in Table 4. In this study, five hypothesis tests, H1, H3, H4, H8, H9 and so on, passed the test at the level of less than 0.001, H2, H5 at the level of less than 0.01, and H6 at the level of less than 0.05. Only the significant level of H7 was 0.074, which did not pass the hypothesis test.
Table 4. Path analysis results

| Hypothetical paths                  | Path coefficient | T Value | P Value | Results |
|-------------------------------------|------------------|---------|---------|---------|
| H1: Recycling attitude → Recycling willingness | 0.260            | 4.161   | ***     | Support |
| H2: Perceptual behavior control → Recycling willingness | 0.200            | 2.775   | **      | Support |
| H3: Subjective norm → Recycling attitude | 0.510            | 7.405   | ***     | Support |
| H4: Perceived benefits → Recycling attitude | 0.230            | 3.605   | ***     | Support |
| H5: Perceived benefits → Recycling willingness | 0.190            | 2.677   | **      | Support |
| H6: Perceived trust → Recycling attitude | 0.150            | 2.543   | *       | Support |
| H7: Perceived trust → Recycling willingness | 0.120            | 1.786   | 0.074   | Nonsupport |
| H8: The degree of convenience → Recycling willingness | 0.300            | 4.364   | ***     | Support |
| H9: Policy publicity → Recycling willingness | 0.140            | 3.350   | ***     | Support |

(Note: *** = the level of P value less than 0.001, ** = the level of P value less than 0.01, * = the level of P value less than 0.05.)

5. Discussion

Recycling attitude and perceived behavior control have significant positive effects on express packaging recycling intention. Attitudes are consumers' subjective evaluation of express package recycling, so the more positive consumers' attitude is, the stronger their intention to participate in express package recycling is. Only when consumers take a positive view of express package recycling and regard it as conducive to environmental protection, will they have the will to participate in express package recycling. Perceptual behavior control is the difficulty and ease that consumers perceive when they recycle express packages.

Consumers' attitudes to express packaging recycling are directly affected by subjective norms and perceived benefits, perceived trust. Consumers will generally understand through government policies, network publicity or the notification of relatives and friends. The stronger the subjective norms are, the more vulnerable they are to the influence of external factors and the influence of other people's opinions. Perceived benefit is an inherent benefit that consumers get when they recycle express packages, such as satisfaction, pride, pleasure, etc. The more one pursues emotional benefits, the more positive one's attitude towards express packaging recycling will be. Perceived benefits not only have a certain effect on attitude, but also affect the express packaging recycling intention to a certain extent.

The degree of convenience and policy propaganda has a significant positive impact on recycling intention. Because consumers often pay more attention to its convenience when they perform certain actions, such as the distance from the recycling point and whether the time is satisfied. The setting of recycling channels and facilities is very important for consumers to decide their willingness to participate in express packaging recycling. Government policies and online publicity will make people aware of the urgency of express packaging recycling.

6. Conclusions

Through the research of this paper, it is helpful for enterprises to put forward theoretical suggestions when carrying out express packaging recycling.

Friends, family members and society should be actively encouraged to interact with each other, urge and support express packaging recycling, so that more and more people can be integrated into express packaging recycling. Enterprises can realize the psychological sense of achievement and satisfaction of consumers through material things, and enhance consumers' perception of the benefits
of participating in express packaging recycling. Enterprises leading express packaging recycling should improve their confidence in consumers, and eliminate the risks consumers perceive. They should establish a complete working system and trust mechanism, establish a good image in the hearts of consumers, and actively improve the level of service.

Enterprises should always pay attention to the convenience of the recycling channels, facilities when carrying out express package recycling. The government should formulate relevant policies for express package recycling, strengthen the implementation of policies and regulations, guide and encourage enterprises and consumers to participate in express package recycling. They should also vigorously publicize the practical significance of express package recycling, let consumers realize the current situation of express package development.

Acknowledgment

Fund Projects: National Natural Science Foundation of China “New Intelligent Algorithm and Formalization of Resource Optimization in Hybrid Elastic Optical Networks”(61572391); Shanxi Natural Science Foundation Project “Research on Knowledge Element Collaborative Indexing and Semantic Integration Oriented to Dynamic Service of Think Tanks” (2016JM7004).

Reference

[1] State Post Office of the People's Republic of China. Statistical bulletin on the development of postal industry in 2017.[EB/OL]. (2018-06-16). http: // www. spb. gov.cn /xw/dtxx_15079/201806/t20180604_1581131.html.

[2] Ajzen I. The theory of planned behavior[J]. Organizational decision and human decision process, 1991:179-211.

[3] Yu F M, Duan X M, Liang H J. An empirical research on recycling behavior of waste electrical and electronic equipment and its influence factor[J]. China Environmental Science, 2011, 31, (12) : 2083-2090.

[4] Lu Y Y, Zhao X. Research on Recycling Behavior of Waste Household Appliances and Electronics Based on TPB: A Case of Shanghai[J]. Management Review, 2009, 21 (08) : 85-94.

[5] Knussen C, Fred Y, Julie M, et al. An analysis of intentions to recycle household waste: the roles of past behaviour, perceived habit, and perceived lack of facilities[J]. Journal of environmental psychology, 2004, Vol.24 (No.2) : 237-246.

[6] Yushkova E, Feng Y. What explains the intention to bring mobile phones for recycling? A study on university students in China and Germany[J]. International economics and economic policy, 2017, Vol.14 (No.3) : 501-516.

[7] Chen L, Wu G, Chen S, et al. Summary of Literatures of Influence of Situational Factors on Waste Recycling Behaviors[J]. Logistics Technology, 2016, (11) : 21-28.

[8] Hu L M, Yu F M. On Consumers' Behavioral Intention of Recycling E-waste[J]. Journal of Hangzhou Dianzi University( Social Sciences), 2012, 8 (03) : 19-24.

[9] Wang Z H, Yin J H. Analysis of Influencing Factors and Characteristics of Electronic Waste Recycling Behavior in Home Appliance Enterprises in China[J]. Management World, 2008 (04) : 175-176.

[10] Sun N J, Guo G Q. Customer Commitment, Self-Enhancement and Customer Citizenship Behavior: Driving Mechanism and Moderating Effect from the Perspective of Social Exchange Theory[J]. Management Review, 2016, (12) : 187-197.

[11] Huang H, Cheng T, Huang W. Impact of online gamers’ personality traits on interdependence, network convergence, and continuance intention: Perspective of social exchange theory[J]. International Journal of Information Management, 2018, Vol.38 (No.1) : 232-242.

[12] Atreyi K, Bernard C Y, Wei K. Contributing knowledge to electronic knowledge repositories: an
empirical investigation[J]. Management Information System Quarterly, 2005. Vol.29 (NO.1):113-143.

[13] Li J Y. Study of Knowledge Sharing in Virtual Communities from the Perspective of Social Exchange Theory[J]. Information Science, 2013, 31 (04): 119-123.

[14] Zhao D M, Ji S X. Trust and Perceived Risk to Online Purchase Intention: An Empirical Study[J]. Journal of Applied Statistics and Manage, 2010, 29 (02): 305-314.