On Consumers' Environmental Motivation and Carbon Reduction Awareness in Their Participation in Second-hand Trading on Xianyu: An Analysis Based on the Theory of Planned Behavior

Zijia Liu

School of Economics and Management, Chang'an University, Xi'an, China

2022904282@chd.edu.com

Abstract. With the growing popularity of environmental protection concepts and heightened awareness of green consumption, more and more consumers start taking an interest in the impact of second-hand trading behaviors on the environment. Xianyu, as China's leading C2C second-hand trading platform, has gathered a large number of young users, making it an important arena for examining sustainable consumption practices. In this study, we investigate the main factors affecting users' intentions to participate in second-hand transactions on Xianyu. Through a questionnaire survey, sample data were collected and analyzed for reliability, descriptive statistics, correlation and multiple regression analysis using SPSS. The results indicate that all of the three core components of TPB, that is, attitude, subjective norms and perceived behavioral control, have a significant positive impact on behavioral intention. Additionally, environmental motivation and carbon reduction awareness, as external variables, also exhibit strong explanatory power. The findings of this study not only enrich the theoretical framework of sustainable consumption but also provide practical insights for platforms like Xianyu to optimize user experience and promote green consumption, thereby contributing to the broader goal of environmental sustainability.

Keywords: Xianyu, theory of planned behavior, environmental motivation, carbon reduction awareness, second-hand trading.

1. Introduction

With the conclusion of the "first stocktake" globally under the Paris Agreement at COP 28 in 2023 and the proposal of China's "dual carbon" goals (carbon peak by 2030 and carbon neutrality by 2060) [1], the circular economy has emerged as a key and core path for reducing resource waste and lower carbon emissions. Second-hand trading platforms, by facilitating the multiple resales of goods, can extend the life cycle of goods and effectively reduce the implicit carbon emissions brought about by the production process of new products. According to a survey by the Ellen MacArthur Foundation, if the life cycle of a garment can be extended by 9 months, then its carbon footprint can be cut down by 30% [2]. Xianyu (Idle Fish), which stands as China's leading C2C second-hand trading platform for idle items, reported a daily turnover of more than 1 billion yuan as of 2024 [3], with its user behaviors playing a pivotal role in further advancing the implementation of low-carbon consumption.

Second-hand trading, as a form of green consumption, is crucial for reducing carbon emissions due to its ability to extend the life cycle of goods and facilitate the reuse of resources. The rise of Xianyu platform has enabled an increasing number of consumers of all ages to take part in this recycling process of products. However, the psychological drives behind the platform users' active involvement in second-hand trading, particularly the mechanisms of environmental motivation and carbon reduction awareness [5], remain to be further explored.

The core structure of the theory of planned behavior (TPB), proposed by Ajzen, is: behavioral intention (BI) is composed of three parts: attitude, subjective norms and perceived behavioral control. Behaviors are determined by two parts, that is, behavioral intention (BI) and perceived behavioral control (PBC) [6]. This framework can be utilized to predict and comprehend the behavioral intentions and actual actions of individuals in situations that require effort. The application of the TPB framework to explore the behavioral drivers of Xianyu users is an innovative practice [7], which

can help uncover how environmental motivation and carbon reduction awareness shape users' behavioral intentions and further drive their second-hand trading behaviors [8]. Additionally, TPB focuses more on the psychological process where "awareness determines behaviors", and has greater practical transformation potential. At the same time, it requires quantifying the whole transmission path, thereby contributing to the optimization and enhancement of Xianyu's strategic design [9].

Theoretically, this study is designed to extend the application boundary of TPB, validate the pathway of carbon reduction awareness in second-hand trading behaviors and enrich the explanatory power of TPB in the field of green consumption. Practically, our findings can provide second-hand platforms with user incentive mechanisms and optimization suggestions to improve their user participation and sustainability, while also fostering the spread of green consumption culture on a larger scale.

2. Analysis of Consumer Participation from the Perspective of TPB

2.1. Research Content

As TPB highlighted the changes in an individual's subjective norms and behavior control across the life cycle, the participants in this survey were classified into four age groups that precisely corresponded to four typical stages in life: education and employment, family and career establishment, career peak, and planning for retirement. Using the sampling survey method, 70 participants were selected randomly for the survey.

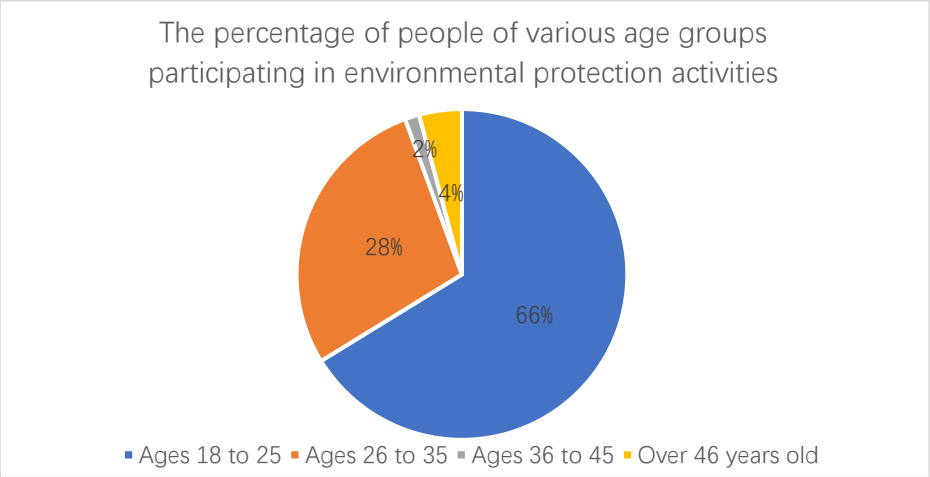

Figure 1. Proportion of Participation in Environmental Behaviors by Age

As shown in Figure 1, 47 of the respondents were teenagers aged 18 to 25, making up 67.14%; 20 were young adults aged 26 to 35, accounting for 28.57%; while users aged 36 to 45 and those over 46 represented 1.43% and 2.86%, respectively.

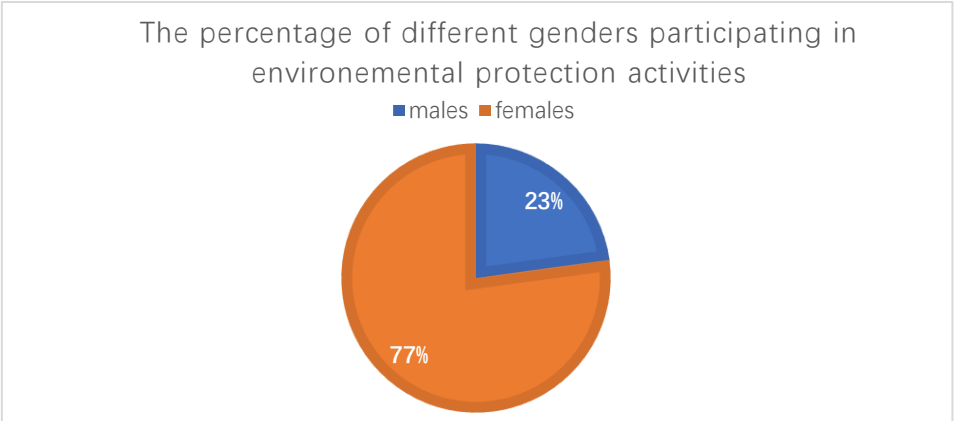

Figure 2. Proportion of Participation in Environmental Behaviors by Gender

As shown in Figure 2, among the 70 randomly selected participants, the proportions of males and females were 22.86% and 77.14% respectively.

It was shown that a majority of Xianyu users had never used the platform (20%) or only used it occasionally (50%). Together, these two groups accounted for 70% of the total, with buyers constituting a larger proportion. The proportion of buyers was 82.14%, while the proportion of sellers was only 50%. This study, based on TPB, established a questionnaire covering the following six dimensions: behavioral intention (BI), attitude (A), subjective norms (SN), perceived behavioral control (PBC), environmental motivation (EM) and carbon reduction awareness (CC), which was rated on a seven-point Likert scale (1=strongly disagree, 7=strongly agree).

2.2. Research Data

A reliability analysis was conducted. To test the internal consistency of each scale dimension, SPSS was utilized to analyze the Cronbach's α coefficient for each dimension. The results are as shown in table 1:

Table 1. SPSS Analysis Results

Dimension	Number of Items	Cronbach's α
Behavioral Intention (BI)	3	0.873
Attitude (A)	3	0.842
Subjective Norms (SN)	2	0.781
Perceived Behavioral Control (PBC)	2	0.801
Environmental Motivation (EM)	2	0.826
Carbon reduction awareness (CC)	2	0.788

As illustrated in Table 1, all six dimensions exhibited Cronbach's α values exceeding 0.7, indicating good internal consistency of the scale. A correlation analysis was then conducted to examine the correlation between each variable and behavioral intention using Pearson's correlation coefficient. The results are as follows:

Table 2. Correlation between Variables and Behavioral Intention

Dimension	Mean	SD
Behavioral Intention (BI)	4.21	0.62
Attitude (A)	4.35	0.57
Subjective Norms (SN)	3.94	0.71
Perceived Behavioral Control (PBC)	4.12	0.64
Environmental Motivation (EM)	4.09	0.66
Carbon reduction awareness (CC)	4.15	0.61

As presented in Table 2, all variables demonstrated a significantly positive correlation with behavioral intention ($p<0.001$), indicating that all TPB dimensions were statistically related to behavioral intention.

Next, a regression analysis was performed with behavioral intention as the dependent variable and the other five dimensions as independent variables. The results are as follows:

Table 3. Multiple Linear Regression Results

Independent Variable	Unstandardized Coefficient (B)	Standardized Coefficient (Beta)	t-value	p-value
Attitude (A)	0.312	0.361	6.121	0.000
Subjective Norms (SN)	0.142	0.127	2.845	0.005
Perceived Behavioral Control (PBC)	0.251	0.298	5.447	0.000
Environmental Motivation (EM)	0.163	0.172	3.411	0.001
Carbon reduction awareness (CC)	0.175	0.189	3.823	0.000

From Table 3, it can be seen that there is a significant positive correlation among five variables and behavioral intentions ($p < 0.001$), indicating that each dimension of TPB is statistically associated with the intention to use. Through SPSS, it was found that $R^2=0.615$, $F=62.728$, $p<0.001$, suggesting excellent overall fit of the model. Attitude (A) and perceived behavioral control (PBC) had the strongest explanatory power on behavioral intention, while environmental motivation (EM) and carbon reduction awareness (CC) also significantly influenced behavioral intention, validating their potential effectiveness as extended variables in TPB framework.

3. Research Findings

The following conclusions can be drawn based on the analysis within the TPB framework: First of all, attitude had a significant positive impact on behavioral intention. Our survey revealed that most respondents posited that "using Xianyu can help recycle resources" and that "buying second-hand items can cut down waste". This implied that environmental awareness was reinforcing their positive attitude, thereby enhancing their behavioral intention. Secondly, the impact of subjective norms was notable yet limited. Many respondents stated that their friends and families were "neutral" or "supportive" towards their use of Xianyu, but the impact of this dimension was weaker than those of attitude and perceived control. This suggested that while external social pressure existed, it was not the dominant factor. Thirdly, perceived behavioral control can strongly facilitate usage patterns. If respondents perceived transactions as convenient, trustworthy, and well-supported with clear logistics, they were more likely to engage in that behavior. The platform's optimization of user experience would further heighten this aspect. Finally, environmental motivation and carbon reduction awareness were key factors of enhancement. Environmental motivation and carbon reduction awareness were the entry points for innovation in this study, and our findings revealed that these two dimensions significantly increased respondents' willingness to use second-hand platforms.

Taken together, consumers' intention to engage in second-hand transactions on Xianyu platforms is mainly affected by their positive attitude towards environmental protection, their perceived control over the platform, and their carbon reduction awareness. Attitude and perceived behavioral control are the dominant factors, followed by subjective norms, with environmental motivation and carbon reduction awareness playing a significant promoting role.

4. Countermeasures and Practical Recommendations

Given that consumers' participation in second-hand trading on Xianyu platform is affected by their attitude towards environmental protection and their perceived control over the platform, it is recommended that the platform should continue to build up users' environmental awareness and establish a carbon footprint visualization system, by embedding a "carbon reduction label" into their product pages [10]. Simultaneously, environmental actions can be visualized using tools like carbon emission reduction points, eco-friendly promotions, as well as the generation of "annual emission reduction reports", with expanded outreach through social media. It is also suggested to popularize eco-friendly videos on the platform and offer small coupon rewards for users who watch them. This can optimize the convenience and security of transactions, thus enhancing perceived behavioral control. The impact of subjective norms can be increased by using social mechanisms, such as establishing a "Green Expert Leaderboard" or adding friend interaction functions. By applying the TPB analysis method, this study offers a more three-dimensional view of how environmental motivation and carbon reduction awareness influence user behaviors, and further drive the translation of user behaviors. It achieves a better practical transformation of the whole psychological process where "awareness determines behaviors", and provides a scientific strategy for upgrading and optimizing the construction of Xianyu platform.

5. Conclusion

This study reveals a complete disconnection between Xianyu users' environmental awareness and behaviors: while 76.8% of users acknowledge the carbon reduction value inherent in second-hand transactions, only 30.36% cite carbon reduction, environmental protection and green as core motives for their transactions. For this reason, the platform needs to integrate carbon reduction awareness into the users' benefit system, to achieve a symbiotic coexistence between environmental protection and business value. Moreover, this study also validates that environmental advocacy needs to shift from the dimension of "moral advocacy" to "visualized, measurable practical incentives". Looking ahead, Xianyu should strive to build a three-in-one circular ecosystem consisting of "carbon records- trust infrastructure- financial incentives", not only to increase the penetration of second-hand trading, but also to transform the platform from a simple online second-hand marketplace to a foundational infrastructure for China's circular economy. This will contribute to the achievement of the "dual carbon" goals.

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