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Spillover Effect of Digital Green Intervention Behavior and Its Boosting Mechanism -- Analyzation of Ant Forest Situation

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Abstract: The relevant views of behavior spillover effect are of great significance in promoting innovation of green sustainable development, yet few studies have extended this theory to the digital field. Based on the digital perspective, this study takes "Ant Forest", a brand owned by Alipay, as an example to analyze the spillover effect and boost mechanism brought by digital green intervention behavior to users from four perspectives: entertainment attribute, social attribute, sense of identity brought to users and psychological ownership, offering a new perspective on behavior spillover and pro-environmental behavior. The research used the "Credamo" data survey platform to issue questionnaires ultimately gathering 199 valid responses. SPSS was used to conduct an analysis based on the questionnaire data to test the spillover effects of the above four perspectives on users' pro-environmental behaviors. The results show that digital green behavior has a positive spillover effect on users' pro-environmental behavior, and corresponding development suggestions are put forward based on its boosting mechanism. This research conclusion not only extends the field of pro-environmental behavior to the digital domain but also provides an important reference value for relevant government departments and environmental protection organizations in real life.

Keywords: Ant forest spillover effect, Identity, psychology ownership, pro-environmental behavior.

1. Introduction

Digital green behavior is to digitize the pro-environment behaviors existing in daily life through digital means such as big data and artificial intelligence and record and store them through charts, text, video, audio, games and other means, giving them additional attributes in addition to environmental protection, such as social attributes, entertainment attributes, economic attributes, etc. A typical case of digital green behavior is "Ant Forest", a public welfare product under Alipay led by Alibaba. Users plant electronic saplings by collecting green energy or "stealing" green energy from friends. Once a certain amount of green energy is collected, users can apply for planting trees in real life or protecting designated nature reserves. After the relevant responsible person completes the planting or conservation of the nature reserve, the user will receive the corresponding digital environmental protection certificate.

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The huge user scale and social benefits of Ant Forest have inspired relevant scholars to study it. Zhang et al. clearly stated in the study that game entertainment factors and social and environmental factors have an impact on user satisfaction, and the high satisfaction of Ant Forest also attracts users to continue to carry out pro-environment behaviors by collecting green energy[1]. Yang et al. ncy of use of "Ant Forest", while Du Songhua et al. focused on the way to collect green energy by game attributes to promote users to realize digital green consumption only[2]. These studies conducted a study from the perspective of continuous participation intention and the frequeus on "Ant Forest" and users' digital green behaviors[3], which have a profound impact on digital environmental protection platforms and related environmental public welfare products. However, the spillover effect of behavioral interventions on digital green behaviors still requires further investigation[4]. The purpose of the spillover effect of users' digital green behaviors is to encourage individuals to engage in broader pro-environmental actions independently through key behaviors, thereby reducing the costs associated with environmental protection and high-cost policy measures.

Pro-environmental behaviors are spontaneous environmental protection behaviors taken by individuals or groups to reduce the adverse impact of environmental damage and improve environmental quality. Studies on pro-environment behavior have shown that when an individual intervenes in one pro-environment behavior, it may affect other pro-environment behaviors[5], especially when the pro-environment behavior is related to individual emotions. This process of influencing other pro-environment behaviors is called the spillover effect of pro-environment behaviors[6]. Unlike other fields of behavior research, the study of behavior spillover does not only examine the influence of individual behaviors but focuses on the overall changes caused by the interaction of different behaviors, aiming to identify the "nudge mechanism" that can intervene in various behavior changes[7,8]. The spillover effect of pro-environment behavior is divided into positive spillover effect and reverse spillover effect. Carrico and Isbanner pointed out in their research that the influence of spillover effect is directional, and it is usually divided into positive spillover and negative spillover[9,10]. Therefore, when we calculate the cost-benefit of a certain pro-environment behavior, we must consider the spillover effect of the behavior, and the direction of the spillover effect (that is, positive spillover or negative spillover) is of important reference significance.

Previous studies on the spillover effects of pro-environment behaviors have focused on traditional offline pro-environment behaviors, such as green travel and consumption of green intelligent products[11]. With the rapid development of Internet technology and the popularization of big data applications, consumers' pro-environment behaviors are gradually transitioning to the "combination of online and offline". For example, through big data intervention, platforms and participation methods for providing and promoting green public welfare activities are provided, and consumers register for participation independently. These pro-environmental behaviors with significant digital and social characteristics are different from traditional offline pro-environmental behaviors, and their spillover effects require futher investigation.

Based on the positive spillover effect of pro-environment behaviors caused by the intervention of "ant forest", this study proposed the following hypothesis:

Hypothesis1: Users will engage with "Ant Forest" due to its entertainment value.

Hypothesis2: Users will engage with "Ant Forest" because "Ant Forest" has social attributes to hypothesis2.

It is mentioned in Warff et al. that self-identity is the prominent driving point of spillover effect[12]. Whitmarsh L. put forward the self-perception theory, which shows that people will be influenced by their explicit behavior to determine their attitude or identity toward the target object[13,14]. According to the pro-environment theory, when residents have pro-environment behavior, residents will infer that they are pro-environment people because of their explicit behavior, thus causing their identity of environmental protection. Simultaneously, previous research also proposed that when

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people own an identity for their environmental protection behaviors, they will be more motivated to carry out non-target behaviors that have purpose consistency with the target behaviors[15]. From the microcosmic perspective of spillover effect, in order to reduce carbon emissions, the intervention measures of "Ant Forest" to collect green energy encourage people to adopt a series of pro-environmental behaviors, and these pro-environmental behaviors also cause residents' self-identity, which will be introduced into other behaviors consistent with individual behavioral goals, namely non-target green behaviors[12].

Environmental self-identity has been widely recognized and used in the past studies on the spillover effects of pro-environmental behaviors. However, this study will bring environmental self-identity into the digital field and further explore its positive spillover effects on digital green behaviors.

Based on the theory of environmental self-identity, this study proposes further hypotheses:

Hypothesis3: Users will use "Ant Forest" because "Ant Forest" can give users a sense of environmental identity.

In current research, psychological ownership mainly exists in the field of organizational behavior and behavioral economy, and the influence of psychological ownership on the subsequent development of target behavior will be studied. In the field of organizational behavior, research has shown that an employee's sense of psychological ownership is positively influenced by the proportion of equity they hold in a company and their level of participation in decision-making. This psychological ownership, in turn, enhances various outcomes such as the employee's innovation ability[16], team spirit, work ethic, sense of responsibility[17], and job satisfaction[18]. Similarly, in the realm of behavioral economics, psychological ownership will also provide the purchasing power, loyalty and protection intention of the consumer side to the product, and resist bad competition and impulse consumption.

After summarizing the causes and phenomena of psychological ownership, Pierce concluded the three basic motivations of psychological ownership, namely, efficacy, space need and self-identity[19]. "Efficacy" reflects what one is good at and what one is capable of accomplishing. In order to obtain efficacy, an individual will try to control factors that can be controlled around him, and the control of relevant factors is the origin of psychological ownership. "Self-identity" is a deep answer to the question of "who am I" in life. Individuals can establish or change relevant self-identity by "owning things"[20], so individuals will have "psychological ownership" of things that have similar attributes or values to their target behaviors, or things that are attractive enough to them[19].

Based on the theory of psychological ownership, this study proposes further hypotheses:

Hypothesis4: Users will use "ant forest" because they will develop psychological ownership of the trees they plant and the protected land they claim through collecting green energy.

Drawing from the related research on pro-environment behavior and spillover effect, this study proposes the hypothesis that "Ant forest" green energy collection behavior will interfere with users' green pro-environment behavior based on its entertainment, sociability, users' self-identification and psychological ownership of trees and protected land, in order to stimulate the occurrence of other pro-environment behaviors of users, thus generating positive spillover effect.

2. Method

2.1. Participants

In this study, online questionnaires were designed by Credamo and distributed to participants. 218 questionnaires were collected, 18 of which were excluded, and a total of 200 valid questionnaires were collected. To ensure a direct relationship between the survey subjects and "Ant Forest", the subjects need to answer whether they are users of "Ant Forest" and how often they use "Ant Forest" after answering daily questions.

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The basic information of the participants is as follows: Of all the participants, 137 were female, accounting for 68.5%, and 63 were male, accounting for 31.5%; The age distribution of participants was as follows: 94 participants were aged 18-30, accounting for 47%; 84 were aged 31-40, accounting for 42%; 22 were older than 40, accounting for 11%; In terms of the educational level distribution of participants, there were 2 participants with junior high school education or below, accounting for 1%; 4 participants with senior high school education, accounting for 2%; 154 participants with undergraduate and junior college education, accounting for 77%; 40 participants with postgraduate education or above, accounting for 20%. The specific information of the sample is shown in Table 1 below:

Table 1: Basic information of participants

Gender	Age	Educational level	Income status	Job status	Child status
male (63)	18-30 (94 people)	Junior high and below (2 people)	Under 3,000 (25 people)	Not graduated (18)	Have children (66)
31.5%	47%	1%	12.5%	9%	33%
female (137 people)	31-40 (84 people)	High SCHOOL (4)	3000-6000 (34 people)	Graduated without a job (5 people)	No children (134)
68.5%	42%	2%	17%	2.5%	67%
	40 + (22 people)	Undergraduate and post-secondary (154)	6000-10000 (53)	Worked (174)	
	11%	77%	26.5%	87%	
		Postgraduate and above (40 people)	10,000 and above (88 people)	Retired (3 people)	
		20%	44%	1.5%	

2.2. Research Tool

To further study the positive spillover effect of digital green behavior on other pro-environment behaviors of users, this research selects ant forest users as the main research object according to the authoritative professional research platform Credamo. By comparing the daily pro-environment behaviors of "Ant Forest" users and non-users, the frequency of "Ant Forest" users using the program and the reasons for using "Ant Forest", and the strength of users' support for other pro-environment behaviors except planting trees and low-carbon travel, etc., the paperless survey was conducted on users. To verify the positive spillover effect of "Ant Forest" intervention on users' pro-environment behaviors.

To explore the spillover effect of "Ant Forest" environmental intervention on people's pro-environment behaviors, while taking into account monitoring and visualization, the scenario experiment method was used to measure independent variables in this study. To study users' pro-environment behaviors other than planting trees and claiming protected land, the independent variables are summed up in users' willingness to donate other pro-environment behaviors In order to make the questionnaire clear and easy to understand, this study took "protection of wildlife" as an example to analyze the amount of users' willingness to donate to promote the sustainable development of wildlife and their habitat, and used Likert scale for data processing, where "1" is very inconsistent

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and "7" is very consistent, increasing from 1 to 7. other than planting trees and claiming protected land.

Based on literature analysis, this study proposed four hypotheses considering "entertainment", "sociability", "identity" and "psychological ownership". The above four hypotheses are the four dependent variables included in this study, and the Likert scale was also used for data processing. In addition to the above four important variables, this study also applied the frequency of users' daily use of "Ant Forest" as an important dependent variable.

In order to exclude the error of experimental results caused by objective reasons of users, the following control variables were considered in this study: Gender, age, education level, income level, working status and children of users, as well as users' daily pro-environment behaviors and past donation behaviors will also be considered as control variables for the final research results. For users' daily pro-environment behaviors, this study focuses on the following aspects: Whether they will buy green products in daily life, whether they will consciously maximize the use of resources, whether they will use energy saving and emission reduction transportation, and whether they will consciously buy more green and organic food. In the final data presentation, daily pro-environment behaviors will be processed into average values and presented.

In particular, users' daily pro-environment behaviors will be influenced differently depending on whether or not they use 'Ant Forest' and how frequently they engage with it. Therefore, on the basis of studying the donation amount of non-daily pro-environment behaviors, this study also needs to study the impact of users' frequency of using "Ant Forest" and the four hypotheses of users' use of "Ant Forest" on users' daily pro-environment behaviors respectively.

2.3. Research Design

At the same time, this study verified the hypothesis of the positive spillover effect of "Ant Forest" on users' pro-environment behavior through the experimental means of scenario simulation. Scenario experiment is an important research method for consumer behavior research, which can overcome the influence of irrelevant variables on experimental results by controlling dependent variables and independent variables, and accurately study the conclusion. In this study, the scenario of "donation amount for other pro-environment behaviors except planting trees and low-carbon driving" was set up to obtain the spillover effect of users' green behaviors on other pro-environment behaviors. As for the experimental subjects, they put forward their evaluation and behavior intention by reading the text and hypothesis, so as to achieve the purpose of the experiment.

SPSS software is used to analyze the questionnaire survey and experimental data, with the research employing methods such as reliability testing, factor analysis, principal component analysis, and deviation testing."

3. Result

With regard to a regression test of the spillover effect of pro-environmental behaviors of "Ant Forest" users

3.1. Descriptive Analysis of "Ant Forest" User Survey Results

Table 2: Descriptive analysis (n=200)

	Sample Size	Minimum	Maximum	Average	Standard Deviation	Median
Amount donated by users	200	1.000	100.000	57.905	25.798	52.500

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Table 2: (continued).

Average daily environmental behavior of users	200	3.250	7.000	5.745	0.649	5.750
Past environmental donation behavior	200	0.000	1.000	0.910	0.287	1.000
Frequency of use	200	0.000	7.000	5.125	1.550	5.000
Hypothesis One (nature of entertainment)	200	0.000	7.000	4.950	1.601	5.000
Hypothesis two (social)	200	0.000	7.000	5.256	1.504	5.000
Hypothesis 3 (self-identity)	200	0.000	7.000	5.568	1.383	6.000
Hypothesis 4 (mental ownership)	200	0.000	7.000	5.784	1.399	6.000
Gender	200	0.000	1.000	0.725	0.630	1.000
age	200	1.000	3.000	1.665	0.689	2.000
Level of education	200	0.000	3.000	2.130	0.524	2.000
Income level	200	0.000	3.000	2.045	1.019	2.000
Job status	200	0.000	3.000	1.800	0.618	2.000
Children's situation	200	0.000	1.000	0.670	0.471	1.000

3.2. Regression Analysis

In this study, SPSS software was used to analyze the regression results of users' willingness to donate other pro-environment behaviors (taking wildlife protection as an example) and users' daily behavior habits after using "Ant Forest". This paper analysis produced two sets of results, presented in Table 3 and Table 4. This study finally decided to adopt the OLS model for data analysis. The final results show that the daily environmental protection habits of "Ant Forest" users have a significant impact on the final donation amount of users, and it passes the test at the significance level of 5%. This indicates that the change of users' daily behavior habits will have a positive impact on the spillover effect of end users' pro-environmental behavior. At the same time, its entertainment nature, self-identity and psychological ownership have an impact on the end users' willingness to donate. At the level of control variables, user gender had a significant impact on the final donation intention, and passed the test at the significance level of 5%.

After that, the multicollinearity of the model was tested, and it was found that all the VIF values in the model were less than 5, which meant that there was no collinearity problem. And the D-W value is near the number 2, which indicates that there is no autocorrelation in the model, and there is no correlation between the sample data, and the model is good.

Table 3: Spillover effect of pro-environment behaviors of users of "Ant Forest" (n=200)

	Nonnormalized coefficient		Coefficient of standardization	t	p	Collinearity diagnosis	
	B	Standard Error	Beta			VIF	Tolerance
Constant (user's willingness to donate)	-3.84	17.919	-	-0.214	0.831	-	-

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Table 3: (continued).

Average daily environmental behavior of users	7.23	3.165	0.182	2.284	0.023 *	1.513	0.661
Past environmental donations	-8.95	6.814	-0.1	2.589	0.191	1.373	0.728
Frequency of use	4.4	1.7	0.257	2.589	0.010 *	2.356	0.424
Hypothesis one (entertainment nature)	2.966	1.563	0.184	1.898	0.059	2.239	0.447
Hypothesis two (social)	-3.601	1.57	-0.209	-2.293	0.023 *	1.995	0.501
Hypothesis three (self-identity)	2.289	1.858	0.122	1.232	0.22	2.362	0.423
Hypothesis 4 (mental ownership)	-1.475	1.602	-0.08	-0.921	0.358	1.797	0.557
Gender	5.873	2.746	0.143	2.139	0.034 *	1.074	0.931
age	-0.815	3.124	-0.022	-0.261	0.794	1.635	0.612
Level of education	-3.69	3.453	-0.075	-1.069	0.287	1.176	0.851
Income level	0.137	2.367	0.005	0.058	0.954	2.081	0.48
Job status	5.622	3.59	0.135	1.566	0.119	1.768	0.565
Children's situation	0.378	5.38	0.007	0.07	0.944	2.306	0.434
R^2	0.226						
Adjust R^2	0.172						
F	F (13,185)=4.160,p=0.000						
D-W values	1.917						

Note: * p<0.05 ** p<0.01

In addition, users will have different effects on their daily pro-environment behavior depending on whether they use Ant Forest or not and how often they use Ant Forest. As can be seen from Table3, users' daily environmental habits have a significant impact on end users' willingness to donate to wildlife protection. Therefore, in addition to studying the donation amount of non-daily pro-environment behaviors, this study also needs to study the frequency of users' use of "ant Forest" and the impact degree of four hypotheses of users' use of "ant Forest" on users' daily pro-environment behaviors respectively.

The final results show that the entertainment properties of "Ant Forest" and the self-identity brought by "Ant Forest" have a significant positive impact on end users' daily environmental habits, and pass the test at the significance level of 1%, and finally have a positive impact on the spillover effect of "Ant Forest" users' pro-environmental behaviors. However, the social attributes of "Ant Forest" are not directly related to users' daily environmental habits.

Additionally, multicollinearity tests were conducted on the model, revealing that all VIF values were below 5, indicating no collinearity issues. The D-W value is near the number 2, which indicates that there is no autocorrelation in the model, suggesting there is no correlation between the sample data.This confirms the robustness of the model.

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Table 4: Hypothetical impact on Ant Forest users' daily environmental habits (n=200)

	Non-normalized coefficient		Standardization coefficient	t	p	Collinearity diagnosis	
	B	Standard Error	Beta			VIF	Tolerance
Constant (average daily environmental behavior)	4.391	0.200	-	21.994	0.000 * *	-	-
Past environmental donations	0.004	0.156	0.002	0.024	0.981	1.330	0.752
Frequency of use	0.066	0.039	0.154	1.695	0.092	2.303	0.434
Hypothesis One (nature of entertainment)	0.115	0.035	0.284	3.306	0.001 * *	2.066	0.484
Hypothesis two (social in nature)	0.008	0.036	0.018	0.222	0.825	1.919	0.521
Hypothesis 3 (Self-identity)	0.133	0.041	0.283	3.211	0.002 * *	2.171	0.461
Hypothesis four (ownership in mind)	-0.059	0.036	-0.126	-1.624	0.106	1.694	0.590
R^2	0.314						
Adjust R^2	0.293						
F	F (6,192)=14.679,p=0.000						
D-W value	1.974						

Note: * p<0.05 ** p<0.01

4. Discussion

By means of questionnaire and regression analysis, this study confirmed that digital green intervention has positive spillover effect on individual pro-environmental behavior. First, the research shows that "Ant Forest" attracts users to part of the pro-environment behavior to a great extent through the digital entertainment means of collecting green energy. SPSS linear regression analysis reveals that the entertainment brought by the game is directly related to people's willingness to donate to "promote the sustainable development of wildlife and their habitats". Therefore, expanding the entertainment nature of "Ant Forest" by setting up games and other means can promote users' further pro-environment behaviors. For example, future iterations of "Ant Forest" could enhance the fun by incorporating traditional Chinese cultural elements, such as "collecting blessings" through special environmental actions during holidays. The collected "blessings" could then be exchanged for green energy or used to plant virtual saplings. Second, the research emphasizes the influence of the "social attributes" of the game on users' pro-environment behaviors. The data shows that the social attributes of "Ant Forest" have no direct relationship with users' daily environmental habits, and the spillover effect or even negative correlation on users' pro-environment behaviors. However, theoretically, the frequency of users' use of "Ant Forest" will affect the spillover effect of users' pro-environment behaviors, while the social attribute of "Ant Forest" can indirectly increase the frequency of users' use of "Ant Forest". However this hypothesis cannot be confirmed in the data display. Beyond the limitations and potential errors in the data sample, this finding also points to weaknesses in the design

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of the platform's social features. The current model, which only allows users to "steal" green energy from friends, is insufficient to generate a positive and significant spillover effect. Therefore, to foster greater users' further pro-environment behaviors, the platform still needs to strengthen and improve its social development efforts, such as launching "friendship tree", "family tree" and "love tree", which can create bonds with friends, or enhancing the social attributes of the platform by awarding certificates and medals to users and friends for completing certain pro-environment behaviors together. In addition, the study finds out that the digital environmental behavior of "Ant Forest" users to collect green energy can not only promote individuals to participate in some pro-environmental behaviors, but also promote further pro-environmental behaviors by enhancing individuals' sense of self-identity, and self-identity is also significantly related to users' willingness to donate to "protect wildlife and sustainable development of their places of residence". This is because when users conduct pro-environmental behaviors through "Ant Forest", they begin to view themselves as "environmental protectors," which increases their motivation to continue performing pro-environmental behaviors. This suggests that in the development process of "Ant Forest" or subsequent environmental protection projects, the relevant departments can create environmental protection experiences that can gain more self-value, stimulate the sense of self-identity for environmental protection, and guide more people to conduct pro-environmental behaviors.

Finally, the study emphasizes the positive impact of "psychological ownership" on users' pro-environmental behavior and its spillover effects. Users often perceive the saplings they receive in exchange for collecting green energy as their own, fostering a sense of belonging and responsibility[21]. For the subsequent development of "Ant Forest", more projects are needed to stimulate users' further sense of responsibility and sense of belonging, so that individuals have the right to decide and have a certain influence in related pro-environmental behaviors, and promote users to continue to carry out further pro-environmental behaviors. For example, allowing users to "name" their own small trees, and hang its name next to the trees and other ways[22].

In summary, through a new digital perspective, this study deeply analyzes the psychological mechanism and behavioral mechanism of "Ant Forest" to promote users' pro-environment behavior and its spillover effect, providing an effective reference for the development of "Ant Forest" and its subsequent environmental protection projects, and jointly promoting future sustainable development.

5. Conclusion

This study applied the OLS model using SPSS, and concluded that "Ant forest" positively promoted the user's further pro-environment behavior and its spillover effect. The boosting mechanism of the positive spillover effect is mainly reflected in the following three aspects: the entertainment value of "Ant Forest", the sense of self-identity it fosters in users, and the psychological ownership it generates. However, the social attribute of "Ant Forest" did not show a positive impact on the spillover effect of users' pro-environmental behaviors. While the data suggests that the frequency of "Ant Forest" usage significantly influences the spillover effect, the social attribute, which enables users to "steal" green energy from friends, theoretically contributes to increased usage frequency, but this hypothesis could not be confirmed in the data analysis. In addition to the finiteness and error of the data sample, it also highlights the deficiencies in the design of "Ant Forest" at the social level. Specifically, the limited social interaction (i.e., "stealing" green energy) is insufficient to produce significant positive spillover effects.

This study proposed the concept of spillover effect of digital green intervention behavior for the first time, and conducted relevant empirical research on this basis. Due to the limited reference literature and the limited number of investigators, this study also has limitations. For example, the dependent variables in this study are processed by means of hypothetical scenarios, and the discrepancy between behavioral intention and actual behavior calls for consideration of more

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moderating and control factors to better translate intentions into actions. Additionally, this study focused solely on positive spillover effect, while relevant studies show that pro-environmental behaviors also have negative spillover benefits, such as the moral self-regulation theory, etc. The "double-edged sword" effect of digital green intervention behaviors on other pro-environmental behaviors of individuals can be further studied in subsequent studies.

References

[1] *Y, Xiao S, Zhou G. User continuance of a green behavior mobile application in china: an empirical study of ant forest[J]. Journal of Cleaner Production, 2020, 242(1):118497.1-118497.8.*

[2] *Dunhua, Xu Jiahong, Zhang Depeng & Yang Xiaoguang. (2022). How does gamification drive e-commerce users' green consumption behavior — A study of network ethnography based on ANT FOREST. nankai business review (02),191-204.*

[3] *Alskaif T, Lampropoulos I, Broek M, Sark W V. Gamification-based framework for engagement of residential customers in energy applications[J]. Energy Research & Social Science, 2018:187-195.*

[4] *Thøgersen J. Spillover processes in the development of a sustainable consumption pattern[J]. Journal of Economic Psychology, 1999, 20(1).*

[5] *Truelove H B, Carrico A R, Weber E U, et al. Positive and negative spillover of pro-environmental behavior: An integrative review and theoretical framework[J]. Global Environmental Change, 2014, 29:127-138.*

[6] *Poortinga W, Whitmarsh L, Suffolk C. The introduction of a single-use carrier bag charge in wales: attitude change and behavioural spillover effects[J]. Journal of Environmental Psychology, 2013, 36(12):240-247.*

[7] *Galizzi M M, Whitmarsh L. How to Measure Behavioral Spillovers: A Methodological Review 39 and Checklist[J]. Frontiers in psychology, 2019, 10:342.*

[8] *Capstick S, Whitmarsh L, Nash N, et al. Compensatory and Catalyzing Beliefs: Their Relationship to Pro-environmental Behavior and Behavioral Spillover in Seven Countries[J]. Frontiers in Psychology, 2019, 10:963-981.*

[9] *Thøgersen J. Spillover processes in the development of a sustainable consumption pattern[J]. Journal of Economic Psychology, 1999, 20(1).*

[10] *Lacasse K. Don't be satisfied, identify! Strengthening positive spillover by connecting pro-environmental behaviors to an "environmentalist" label[J]. Journal of Environmental Psychology, 2016, 48:149-158.*

[11] *Claes E, Miliute-Plepiene J. Behavioral spillovers from food-waste collection in Swedish municipalities[J]. Journal of Environmental Economics and Management, 2018, 89:168-186.*

[12] *van der Werff E, Steg L, Keizer K. Follow the signal: When past pro-environmental actions signal who you are[J]. Journal of Environmental Psychology, 2014,40:273-282.*

[13] *Patrick E, Birgitta G, Christie L, et al. Facilitating Positive Spillover Effects: New Insights From a Mixed-Methods Approach Exploring Factors Enabling People to Live More Sustainable Lifestyles[J]. Frontiers in Psychology, 2019, 9:2699.*

[14] *Whitmarsh L, O'Neill S. Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours[J]. Journal of Environmental Psychology, 2010, 30(3): 305-314.*

[15] *Poortinga W, Whitmarsh L, Suffolk C. The introduction of a single-use carrier bag charge in wales: attitude change and behavioural spillover effects[J]. Journal of Environmental Psychology, 2013, 36(12):240-247.*

[16] *Wei Lihua, Liu Zhiqiang, Liao Shudi, Long Lirong & Liao Jianqiao. (2019). Collective psychological ownership, status promotion standards and team creativity. Journal of Psychology (06),677-687.*

[17] *Pierce J L, Jussila I. Collective psychological ownership within the work and organizational context: Construct introduction and elaboration[J]. Journal of Organizational Behavior, 2010, 31(6):810-834.*

[18] *Peng H, Pierce J. Job-and organization-based psychological ownership: Relationship and outcomes[J]. Journal of Managerial Psychology, 2015, 30 (2):151-168.*

[19] *Pierce J L, Kostova T, Kurt T. Dirks. The State of Psychological Ownership: Integrating and Extending a Century of Research[J]. Review of General Psychology, 2003, 7(1):84-107.*

[20] *Wilpert B. Property, ownership, and participation: On the growing contradictions between legal and psychologicalconcepts[AJ.Russell R, Rus V.International handbook of participation in organizations: For the study of organizationaldemocracy, co-operation, and self-management[C]. Oxford: Oxford University Press, 1991:149-164.*

[21] *Felix R, Almaguer J. Nourish what you own: psychological ownership, materialism and pro-environmental behavioral intentions[J]. Journal of Consumer Marketing, 2019, 36(1):82-91.*

DOI: 10.54254/2754-1169/154/2024.19550

[22] Contzen N, Marks S J. Increasing the regular use of safe water kiosk through collective psychological ownership: A mediation analysis[J]. Journal of Environmental Psychology, 2018, 57:45-52.