Research on the Mechanisms Influencing Consumers' Privacy Protection Intentions on E-commerce Platforms

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Abstract. [Purpose] This study explores the antecedents and mechanisms of consumers' privacy protection behavior on e-commerce platforms, aiming to assist e-commerce enterprises in formulating more reasonable user privacy policies and permissions. The goal is to build a healthy and rational information ecosystem. [Methods] This research constructs an analytical framework based on consumer personality traits, usage perceptions, and privacy information protection behavior to comprehensively analyze the influencing mechanisms of consumer privacy protection behavior. The study utilizes a Structural Equation Modeling (SEM) approach for empirical testing. [Results] Consumer personality traits have a heterogeneous impact on usage perceptions, with perceived benefits only being associated with the openness trait. Most traits influence the formation of trust perceptions and privacy concerns. Trust is a crucial direct factor and mediator for consumer privacy protection behavior, with a significant alleviating effect on privacy concerns. Consumer perceived benefits mainly act through the formation of trust emotions towards the platform. Under the influence of past negative experiences, there is a noticeable difference in the direct effect of privacy concerns, with consumers having negative experiences exhibiting a more pronounced promotion effect on privacy protection. [Conclusion] From a more comprehensive perspective, this study analyzes the antecedents and mechanisms of consumer privacy protection behavior. It provides insights for adjusting e-commerce platform privacy policies and implementing reasonable management measures.

Keywords: Privacy protection; Personality traits; E-commerce platforms; Privacy computing model

1 Introduction

With the rapid development and widespread adoption of internet technology, e-commerce platforms are playing an increasingly vital role in people's daily lives, offering convenient, swift, and personalized services. Concerns about individual privacy protection have also raised. Consumers on e-commerce platforms generate a substantial amount of personal information during the shopping process, which is collected and utilized by the platforms. Despite consumers claiming to be highly concerned about their online privacy, their shopping behavior

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often does not reflect this concern, leading to a phenomenon known as the privacy paradox. This phenomenon may be attributed to factors such as information asymmetry, instant gratification, feelings of powerlessness, and excessive trust.

However, the challenge lies in how to provide high-quality services while protecting consumer privacy, meanwhile addressing privacy paradox. For platforms, the effort to offer personalized services based on privacy information while facing the risk of consumer churn due to privacy concerns is evident[1]. Consumers, on the other hand, express high levels of privacy concern while continuously sharing their privacy on e-commerce platforms. The privacy paradox, marked by the disparity between consumers' heightened privacy concerns and their lack of privacy protection, disrupts the information exchange order and interaction efficiency within e-commerce platforms[2]. Service providers on these platforms find it challenging to avoid shifting responsibility and dealing with complaints stemming from the privacy paradox.

2 Related Research

The academic definition of privacy is in a state of dynamic development. Some scholars believe that privacy is the private information or affairs that the parties do not want to disclose that have nothing to do with the public interest[3], which is a kind of subjective cognition and has individual differences. The development of the Internet has further expanded the connotation of the concept of privacy[4], and the subject of privacy is no longer limited to natural persons, but also includes organizations and groups[5]. Consumer privacy perception, in the e-commerce model, is defined as a subjective possibility that consumers feel and perceive that their private information is acquired, utilized, or leaked by e-commerce-related entities in the process of consumption in line with their personal expectations.[6]. Consumer privacy perception is a subjective perception, which shows different perceptions with different consumers. For the same privacy situation, the higher the expectation that exists in the consumer, then the lower their privacy perception, and on the contrary the higher the privacy perception[7]. With the development of e-commerce economy, consumers' privacy protection needs are gradually increasing and affecting consumer behavior.

Privacy protection of mobile network users means that users prevent personal information leakage by utilizing the privacy protection function provided by mobile devices or mobile APPs, and subjective factors and perceptions such as personality traits affect privacy protection. Extroverted, easy-going and neurotic users are more concerned about their privacy and are more likely to use the location service function of mobile apps, while users with responsible personality are more likely to give up using the location service function when they perceive that the location service fails[8]. Person-to-person and person-to-platform mistrust enhances the use of mobile app privacy protection features[9]. Increased perceived susceptibility and severity of users' information risk can motivate consumers to start and enhance the use of privacy protection features. The self-efficacy of social network users positively contributes to the adoption of privacy protection measures to protect personal privacy[10]; Increased user response effectiveness increases willingness to protect and leads to self-protection measures[11].

The Big Five personality model inherits the results of the previous research[12,13] and categorizes individual personality traits into five types: neuroticism, extraversion, openness, pleasantness, and responsibility. Among them, pleasantness and responsibility belong to the interpersonal

dimension, extraversion favors the temperament dimension, neuroticism is the emotional dimension, and openness is related to cognition. The Big Five personality model has been widely used in the study of individual behavior and willingness and linked to the analysis of Internet users' perception of privacy as a key factor. Bansal et al[14] showed through their analysis that different personality traits affect the formation of users' perception of trust and privacy apprehensions. Pentina et al[15] incorporated personality trait categorization into the framework of privacy computational analysis to further confirmed that there are differences in the formation process of perceived benefits and privacy apprehension among users with different personality traits. Min Zhang et al. found that users with different personality traits have significant differences in location disclosure behavioral choices[8]. Zhang Kailiang et al. further found that extraversion and openness personality traits showed positive correlation with users' information self-disclosure behavior, while responsible and neurotic personality showed negative correlation with them[16].

2.1 Literature review

A comprehensive review of the above literature reveals the following insights: (1) The perceived privacy and benefits formed during consumer platform usage play a significant role as antecedents in individual information disclosure or protection behavior. (2) Consumer personality traits exhibit notable differences in their formative roles in perceptions during usage. (3) There is limited research analyzing the presence or absence of consumers' past negative experiences, and consumer trust perception is infrequently incorporated into the analysis framework.

3 Theoretical model and research hypotheses

3.1 Theoretical model

This study integrates privacy calculus theory and the Big Five personality classification model, considering consumer usage perceptions as an intermediate variable in constructing the theoretical model. Furthermore, the study conducts heterogeneous analysis based on consumers' past negative experiences, treating this factor as a moderating variable directly influencing privacy concerns. Figure 1. illustrates the theoretical model of this study.

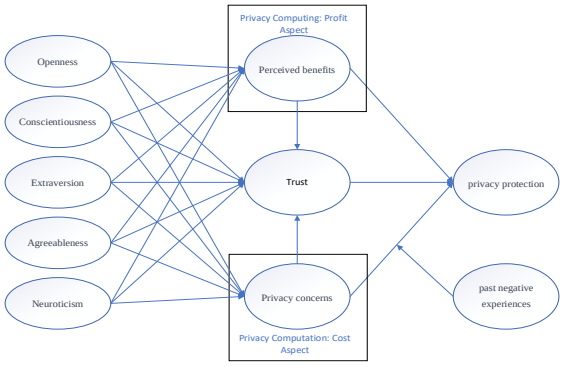

Fig.1. Theoretical Model of the Study.

3.2 Research hypotheses

The following Table 1 summarizes the research hypotheses.

Table 1. Summary of Research Hypotheses.

Serial Number	Hypothesis Content	Reference
Hypothesis 1	Openness positively influences perceived benefits.	
Hypothesis 2	Openness negatively influences privacy concerns.	[17,14,18,19]
Hypothesis 3	Openness positively influences trust.	
Hypothesis 4	Conscientiousness positively influences perceived benefits.	
Hypothesis 5	Conscientiousness positively influences privacy concerns.	[8,20,21]
Hypothesis 6	The impact of conscientiousness on trust is uncertain.	
Hypothesis 7	Extraversion positively influences perceived benefits.	
Hypothesis 8	Extraversion negatively influences privacy concerns.	[8,22–25]
Hypothesis 9	Extraversion positively influences trust.	
Hypothesis 10	Agreeableness positively influences perceived benefits.	
Hypothesis 11	Agreeableness positively influences privacy concerns.	[8,21,24]
Hypothesis 12	Agreeableness positively influences trust.	
Hypothesis 13	Neuroticism negatively influences perceived benefits.	
Hypothesis 14	Neuroticism positively influences privacy concerns.	[26–28]
Hypothesis 15	Neuroticism negatively influences trust.	
Hypothesis 16	Perceived benefits negatively influence willingness for personal privacy protection.	[29,30]
Hypothesis 17	Perceived benefits positively influence trust.	
Hypothesis 18	Privacy concerns positively influence willingness for personal privacy protection.	[31–33]
Hypothesis 19	Privacy concerns negatively influence trust.	
Hypothesis 20	Trust negatively influences willingness for personal privacy protection.	[33,34]
Hypothesis 21	As the value of past negative experiences increases, the positive impact of privacy concerns on the willingness for personal privacy protection is strengthened.	[11,35,36]

4 Research design

4.1 Questionnaire design and Date Resource

This article employs a questionnaire survey method to validate the research model. Most of the variable indicators are derived from previous research and slightly modified to consider the specific context. All items are measured using a 7-point Likert scale, except for the measurement items related to responsibility, which are reverse-scored (i.e., scores ranging from "completely agree" to "completely disagree"), and the measurement items related to past negative experiences. The specific questionnaire question set is detailed in Table 2.

A total of 580 questionnaires were distributed in this survey. By utilizing the screening questions set in the questionnaire (i.e., whether the actual time spent on filling out the questionnaire is not less than 60 seconds) as the basis for filtering and summarizing, a total of 557 valid questionnaires were obtained.

Table 2. Variables and Measurement Items.

Variable name	Index content	Option content
Openness	I like going to social and entertainment parties	1–7 The Likert scale
	I am always very happy and very energetic	1–7 The Likert scale
	At busy parties, I often take the initiative and have fun	1–7 The Likert scale
Agreeableness	I am tolerant	1–7 The Likert scale
	I am very polite and very friendly to people	1–7 The Likert scale
	I think most people are basically well-intentioned	1–7 The Likert scale
Neuroticism	I'm prone to anxiety	1–7 The Likert scale
	My emotions went up and down greatly	1–7 The Likert scale
	I always worry that something bad would happen	1–7 The Likert scale
Conscientiousness	I work or study very hard	1–7 The Likert scale
	I was careful as I finished the task	1–7 The Likert scale
	I think I am unorganized / careless (reverse score)	1–7 The Likert scale
Extraversion	I am very curious about the new things	1–7 The Likert scale
	I like to make some new ideas and new ideas	1–7 The Likert scale
	I like to break the rules and experience the novelty	1–7 The Likert scale
Perceived benefits	In the process of using the e-commerce platform, I think the disclosure of detailed delivery address will obtain more accurate and fast delivery services.	1–7 The Likert scale
	In the process of using the e-commerce platform, I think using the real mobile phone number will enable me to get more accurate and fast delivery service.	1–7 The Likert scale
	In the process of using the e-commerce platform, I think disclosing personal information such as personal browsing records and clicking to the e-commerce platform will obtain better product promotion services.	1–7 The Likert scale
Privacy concerns	In the process of using the e-commerce platform, I worry that the disclosure of personal privacy information (such as name, address, telephone number, personal browsing record, etc.), which will increase the risk of economic losses (such as fraud caused by the disclosure of personal information).	1–7 The Likert scale
	In the process of using e-commerce platforms, I worry that the disclosure of personal privacy information (such as name, address, telephone number, personal	1–7 The Likert scale

Variable name	Index content	Option content
	browsing record, etc.) will increase the risk of mental loss (such as telephone harassment due by the disclosure of personal information).	
	In the process of using e-commerce platforms, I worry that the information collection policy of e-commerce platforms (collecting personal basic information, commodity browsing and other information to generate a description of consumers' consumption preferences) will increase the risk of excessive push and guiding consumption.	1–7 The Likert scale
Trust	I believe that e-commerce platforms will collect user data in accordance with relevant laws and regulations, and will not excessively collect users' personal information.	1–7 The Likert scale
	I believe that the e-commerce platform can comply with the relevant laws and regulations to protect my information in the collection and transmission of personal privacy data.	1–7 The Likert scale
	I believe that the e-commerce platform can comply with relevant laws and regulations to protect my information when personal privacy data is stored and used.	1–7 The Likert scale
Privacy Protection	In the process of consumption on e-commerce platforms, I will understand and use privacy agreements and privacy Settings.	1–7 The Likert scale
	In the process of consumption on e-commerce platforms, I will read and understand the privacy policies of e-commerce platforms.	1–7 The Likert scale
	In the process of consumption on e-commerce platforms, I will avoid clicking on unknown links or participating in activities that may threaten personal privacy (such as real-name online group pooling, etc.).	1–7 The Likert scale
Past Negative Experiences	I have been a victim of privacy violations.	Yes / no / uncertain

5 Results of SEM Analysis

5.1 Measurement model

After the formal implementation of the survey, the collected online questionnaire data were organized, and a preliminary analysis was conducted to determine the reliability of the questionnaire survey results. To assess the reliability and validity of the questionnaire items, Cronbach's α coefficient, Kaiser-Meyer-Olkin (KMO) sampling adequacy measure, and Bartlett's sphericity test were employed. The results obtained from SPSS software are presented in Table 3.

Table 3. Formal Questionnaire.

Scale items	Cronbach's α	Number of KMO sampling suitability quantities	Bartlett sphericity test		
			Approximate chi square	free degree	significance probability
Openness Scale	0.719	0.791	337.173	3	0.001
Responsibility scale	0.781	0.721	169.602	3	0.001
Extravagance scale	0.725	0.798	334.038	3	0.001
Pleasant Scale	0.818	0.706	151.536	3	0.001
Neural quality table	0.844	0.730	688.263	3	0.001
Perceived income scale	0.825	0.712	636.261	3	0.001
Privacy Concern Scale	0.782	0.704	484.283	3	0.001
Trust scale	0.855	0.731	753.953	3	0.001
The Personal Privacy Protection scale	0.656	0.716	334.654	3	0.001

According to the above data, it is found that the Cronbach α coefficient of perceived benefit, privacy concern and trust scale in this questionnaire is relatively high, with good internal consistency and high reliability level[37]; the Cronbach α coefficient of Big Five Personality scale and personal privacy protection scale is relatively low, so there are some internal consistency problems. The KMO coefficient was all above the threshold of 0.7[38,39], and the significance level of the Bartlett sphericity test was significantly lower than 1%, indicating that the questionnaire had a good overall validity level.

5.2 Syntactic model

Based on the above reliability and validity test, this paper analyze the constructed model based on the maximum likelihood estimation method, and obtains the path regression results. Table 4. shows the overall fit of the final constructed SEM model. The data in the table show that most of the model adaptation indicators meet the adaptation standard, and only the recommended value of the modified fitting index (AGFI) is slightly less than 0.9, but the small gap is still acceptable[40,41]. This shows that the fit of the model is relatively ideal and the model fit is good.

Table 4. Model to Construct the Fit Index.

Fits the index	χ^2/df	GFI	RMSEA	CFI	TLI	AGFI	PGFI	PNFI
Recommended value	<3	>0.8	<0.08	>0.9	>0.9	>0.9	>0.5	>0.5
actual value	2.173	0.913	0.045	0.917	0.904	0.893	0.740	0.741
Model fit	yes	yes	yes	yes	yes	no	yes	yes

Table 5. Regression Analysis of Personality Traits and Perceived Pathways.

Return Path	Non-normalized Regression Coefficients				Standardized Path Coefficient
	Estimate	S.E.	T-test	P	
Openness → Perceived Benefits	-0.101	0.094	-1.074	0.283	-0.061
Conscientiousness → Perceived Benefits	0.114	0.15	0.758	0.449	0.05
Extraversion → Perceived Benefits	0.789	0.092	8.538	***	0.561
Agreeableness → Perceived Benefits	0.053	0.115	0.462	0.644	0.028

Return Path	Non-normalized Regression Coefficients				Standardized Path Coefficient
	Estimate	S.E.	T-test	P	
Neuroticism → Perceived Benefits	0.04	0.04	1.005	0.315	0.048
Openness → Privacy Concerns	0.208	0.089	2.334	0.02	0.147
Conscientiousness → Privacy Concerns	0.579	0.173	3.351	***	0.292
Extraversion → Privacy Concerns	0.028	0.077	0.367	0.714	0.023
Agreeableness → Privacy Concerns	0.399	0.114	3.493	***	0.245
Neuroticism → Privacy Concerns	0.16	0.038	4.201	***	0.224
Openness → Trust	0.154	0.082	1.884	0.06	0.101
Conscientiousness → Trust	0.384	0.151	2.553	0.011	0.18
Extraversion → Trust	0.352	0.093	3.795	***	0.269
Agreeableness → Trust	0.461	0.117	3.941	***	0.263
Neuroticism → Trust	0.041	0.036	1.157	0.247	0.054
Perceived Benefits → Trust	0.387	0.059	6.548	***	0.416
Privacy Concerns → Trust	-0.219	0.062	-3.545	***	-0.203
Trust → Personal Privacy Protection	0.62	0.064	9.676	***	0.641
Perceived Benefits → Personal Privacy Protection	-0.022	0.056	-0.39	0.696	-0.024
Privacy Concerns → Personal Privacy Protection	0.208	0.049	4.225	***	0.199

Table 6. The Hypothesis Analysis Table.

Hypothesis	Relationship	Path Coefficient	Significance Probability	Conclusion
H1	Openness positively influences perceived benefits.	-0.101	0.283	Hypothesis not supported.
H2	Openness negatively influences privacy concerns.	0.208	0.02	Hypothesis not supported.
H3	Openness positively influences trust.	0.154	0.06	Hypothesis supported.
H4	Conscientiousness positively influences perceived benefits.	0.114	0.449	Hypothesis not supported.
H5	Conscientiousness positively influences privacy concerns.	0.579	***	Hypothesis supported.
H6	The effect of conscientiousness on trust is undetermined.	0.384	0.011	Hypothesis supported.
H7	Extraversion positively influences perceived benefits.	0.789	***	Hypothesis supported.
H8	Extraversion negatively influences privacy concerns.	0.028	0.714	Hypothesis not supported.
H9	Extraversion positively influences trust.	0.352	***	Hypothesis supported.

H10	Agreeableness positively influences perceived benefits.	0.053	0.644	Hypothesis not supported.
H11	Agreeableness positively influences privacy concerns.	0.399	***	Hypothesis supported.
H12	Agreeableness positively influences trust.	0.461	***	Hypothesis supported.
H13	Neuroticism negatively influences perceived benefits.	0.040	0.315	Hypothesis not supported.
H14	Neuroticism positively influences privacy concerns.	0.160	***	Hypothesis supported.
H15	Neuroticism negatively influences trust.	0.041	0.247	Hypothesis not supported.
H16	Perceived benefits negatively influence personal privacy protection.	-0.022	0.696	Hypothesis not supported.
H17	Perceived benefits positively influence trust.	0.387	***	Hypothesis supported.
H18	Privacy concerns positively influence personal privacy protection.	0.208	***	Hypothesis not supported.
H19	Privacy concerns negatively influence trust.	-0.219	***	Hypothesis not supported.
H20	Trust positively influences personal privacy protection.	0.620	***	Hypothesis supported.

Based on the result of SEM analysis, this study verifies the research hypotheses proposed earlier. From the analysis of Tables 5 and 6, it can be observed that (1) the hypothesis regarding the influence of consumer Big Five personality traits on perceived use is partially unsupported. The perceived value of e-commerce platform consumers is only influenced by external personality traits. Privacy concerns are influenced by conscientiousness, extroversion, agreeableness, and neuroticism traits, all exhibiting a positive promoting effect. There are multiple factors positively influencing perceived trust, the roles of responsibility and openness are of relatively low significance relative to the other personality traits. Hypothesis 15, which posited that neuroticism negatively influences perceived trust, is not supported by the model. The academic community has inconsistent conclusions regarding the direction of the effect of conscientiousness on trust. Empirical tests in this study show a significant positive promoting effect of conscientiousness on perceived trust in e-commerce platform consumers.

(2) All the pathways of action were significant at the level of 1%. Specifically, consumers 'trust perception of the platform companies' privacy protection willingness and ability is an obvious way to promote personal privacy protection, and also has an obvious positive effect on the privacy protection behavior. In the use of e-commerce platforms, consumers can obtain personalized personal experience and convenience through authorized complete personal information and preference information, thus improving the trust perception of consumers on the privacy protection ability of e-commerce platforms; On the other hand, consumers considering the possible privacy loss (economic loss, mental loss) may lead to the rejection of personal information collection of e-commerce platforms, and then reduce the trust degree of users on e-commerce platforms, and promote the personal privacy protection behavior of consumers.

5.3 Mediator effect analysis

This paper analyzes the indirect effect of the consumer personality on personal privacy protection behavior, the Bootstrap method proposed by Preacher and Hayes was used for mediation effect test, setting Bootstrap=5000 and a confidence of 95%[42]. The test results are shown in Tables 7 and 8.

Table 7. Analysis of the Mediation Effect of Five Personality.

Path	Standardized Indirect Effect Estimates	The Mean Indirect Effect	And 95% Confidence Intervals		Significance Probability	Conclusion
			Lower Boundary	Upper Boundary		
Openness→Perceived Benefits →Personal Privacy Protection	0.001	0.003	-0.009	0.029	0.616	The mediating effect is not significant
Openness→Trust →Personal Privacy Protection	0.065	0.066	-0.021	0.170	0.125	The mediating effect is not significant
Openness→Privacy Concerns →Personal Privacy Protection	0.029	0.030	0.002	0.070	0.032	The mediating effect is significant
Openness→Perceived Benefits →Trust→Personal Privacy Protection	-0.016	-0.016	-0.058	0.014	0.256	The mediating effect is not significant
Openness → Privacy Concerns → Trust → Personal Privacy Protection	-0.019	-0.019	-0.049	-0.003	0.020	The mediating effect is significant
Conscientiousness → Perceived Benefits → Personal Privacy Protection	-0.001	-0.002	-0.032	0.01	0.605	The mediating effect is not significant
Conscientiousness → Trust → Personal Privacy Protection	0.115	0.111	0.02	0.248	0.031	The mediating effect is significant
Conscientiousness → Privacy Concerns → Personal Privacy Protection	0.058	0.058	0.021	0.127	0.001	The mediating effect is significant
Conscientiousness → Perceived Benefits → Trust → Personal Privacy Protection	0.013	0.013	-0.031	0.060	0.537	The mediating effect is not significant
Conscientiousness → Privacy Concerns → Trust → Personal Privacy Protection	-0.038	-0.038	-0.133	-0.012	0.001	The mediating effect is significant
Extraversion → Perceived Benefits → Personal Privacy Protection	-0.014	-0.014	-0.113	0.095	0.816	The mediating effect is not significant

Path	Standardized Indirect Effect Estimates	The Mean Indirect Effect	And 95% Confidence Intervals		Significance Probability	Conclusion
			Lower Boundary	Upper Boundary		
Extraversion → Trust → Personal Privacy Protection	0.172	0.173	0.060	0.287	0.003	The mediating effect is significant
Extraversion → Privacy Concerns → Personal Privacy Protection	0.005	0.005	-0.021	0.035	0.713	The mediating effect is not significant
Extraversion → Perceived Benefits → Trust → Personal Privacy Protection	0.149	0.149	0.086	0.247	0.001	The mediating effect is significant
Extraversion → Privacy Concerns → Trust → Personal Privacy Protection	-0.003	-0.003	-0.026	0.012	0.649	The mediating effect is not significant
Agreeableness → Perceived Benefits → Personal Privacy Protection	-0.001	0.000	-0.026	0.008	0.609	The mediating effect is not significant
Agreeableness → Trust → Personal Privacy Protection	0.169	0.172	0.069	0.299	0.002	The mediating effect is significant
Agreeableness → Privacy Concerns → Personal Privacy Protection	0.049	0.050	0.016	0.104	0.001	The mediating effect is significant
Agreeableness → Perceived Benefits → Trust → Personal Privacy Protection	0.007	0.008	-0.026	0.048	0.681	The mediating effect is not significant
Agreeableness → Privacy Concerns → Trust → Personal Privacy Protection	-0.032	-0.032	-0.077	-0.010	0.002	The mediating effect is significant
Neuroticism → Perceived Benefits → Personal Privacy Protection	-0.001	-0.002	-0.021	0.008	0.612	The mediating effect is not significant
Neuroticism → Trust → Personal Privacy Protection	0.035	0.034	-0.037	0.092	0.298	The mediating effect is not significant
Neuroticism → Privacy Concerns → Personal Privacy Protection	0.045	0.043	0.025	0.073	0.001	The mediating effect is significant
Neuroticism → Perceived Benefits → Trust → Personal Privacy Protection	0.013	0.013	-0.011	0.044	0.323	The mediating effect is not significant
Neuroticism → Privacy Concerns → Trust → Personal Privacy Protection	-0.029	-0.029	-0.069	-0.011	0.001	The mediating effect is significant

Table 8. Analysis of Consumer-Perceived Mediation Effects.

Influence Path	c Gross Effect	a	b	a*b Mesomeric Effect	a*b(95%BootCI)	c' Direct Effect	Conclusion
Perceived Benefits → Trust → Personal Privacy Protection	0.242***	0.416***	0.641***	0.266***	0.155~0.412	-0.024	Completely intermediary
Privacy Concerns → Trust → Personal Privacy Protection	0.069	-0.203***	0.641***	-0.130***	-0.085~-0.014	0.199***	Part of the intermediary

The significance of the mediating effects of consumers' Big Five personality traits varies. Specifically, Openness mainly affects the intention of personal protection through the direct and indirect effects of privacy concerns, with the roles of perceived benefits and trust being less pronounced. Conscientiousness significantly influences privacy protection behavior through the mediation of consumer privacy concerns and trust, with the mediating effect of perceived benefits being less obvious. Agreeableness follows a similar path. Extroversion primarily influences privacy protection behavior through the role of consumer trust or by forming trust emotions through perceived benefits, thereby affecting privacy protection behavior. Neuroticism is strongly correlated with consumer privacy concerns, with the mechanism involving the direct or indirect impact of consumer privacy concerns on individual protection intentions.

There are notable differences in the actual mechanisms of the effects of consumer perceived benefits and privacy concerns. Trust plays a completely mediating role in the path of perceived benefits, with the direct effect of perceived benefits on individual privacy protection not being significant. Privacy concerns have a clear direct promoting effect on individual privacy protection behavior. However, at the same time, consumer trust plays a distinct inhibitory role, mitigating the promoting effect of privacy concerns on privacy protection behavior.

5.4 Regulatory effect analysis

Previous studies have found that the promotion of consumer privacy concerns will enhance the leakage of personal privacy information or excessive push on e-commerce platform. In this paper, the data of consumers' past negative experience and their interaction term with privacy concerns are introduced into the model. The hierarchical regression method is adopted to measure the path coefficient of the influence of past negative experience and past negative experience and privacy concerns on personal privacy protection respectively, and the data results in the following table are obtained.

Table 9. Test of Regulatory Effects.

	Model 1	Model 2	Model 3
Privacy Worry	0.163***	0.164***	0.167***

	(0.048)	(0.048)	(0.047)
Past Negative Experiences		-0.050	-0.032
		(0.040)	(0.039)
Privacy Concerns*Past Negative Experiences			-0.128* (0.075)
χ^2/df	3.253	3.257	3.233
RMSEA	0.064	0.064	0.063

The results in table 9 show that the past negative experience and the interaction term with consumer privacy concerns are gradually replaced into the model, the fitting effect of the model is gradually improved, and the promotion effect of consumer privacy concerns on personal privacy protection behavior is strengthened and maintained significantly. The individual effect of personal negative past experience is not obvious, and the interaction item with privacy concerns has a certain negative impact on personal privacy protection behavior. Hypothesis 21 gives a preliminary verification.

Table 10. Analysis of Past Negative Experience Heterogeneity.

Group	Direct Effect	Indigo Effect	Ensemble
Past Experience the Negative Group	-0.149	0.459	0.310
Past Experiences are not Negative Group	0.307	-0.235	0.072

Table 10 shows the result of classifying the sample and regressing respectively according to the past negative experience. Through the comparison of the model fitting results of negative group and non-negative group with past experience, it can be found that the privacy concerns of consumers with negative past experience in the use of e-commerce platforms have a more obvious overall promotion effect on personal privacy protection behavior, which is much higher than that of consumers who do not have any past negative experience. Compared with consumers who do not have negative experience, the privacy concerns of consumers with past negative experience will greatly reduce the level of trust in the e-commerce platform, thus affecting the choice of personal privacy protection behavior. The negative experiences of consumers will affect privacy protection behavior from direct and indirect ways, with obvious heterogeneity between groups, has been concluded from multiple perspectives.

6 Conclusions

6.1 Conclusion of the study findings

This paper empirically examines the effects of consumer personality traits on e-commerce platform usage perceptions and personal privacy protection behaviors from the perspective of consumers' Big Five personality and analyses the antecedents and heterogeneous influences on consumers' usage perceptions.

The empirical results show that: (1) there is a significant positive facilitating effect of privacy apprehension on consumer privacy protection behavior, and the direct mitigating effect of perceived gain is not significant. (2) Perceived trust is facilitated and impeded by the role of perceived gains and privacy apprehension, forming a promotion of privacy-protective behaviors as a full mediator of perceived gains, and significantly mitigating the positive effect of privacy

apprehension. (3) Consumers' past negative experiences significantly affect the promotion of privacy apprehension on personal privacy protection behavior, and the positive promotion effect of consumers with negative experiences is stronger and the mitigating effect of trust perception is relatively weaker compared to consumers without past negative experiences. (4) Perceived benefits received only the positive effect of the extraversion trait, while other stronger consumers were more likely to develop privacy apprehension in platform use. (5) Consumers with different traits do not differ significantly in the generation of trust emotions, but the mediating role of trust perception with perceived gains and privacy apprehension is still an important way to influence individuals' privacy protection behaviors.

6.2 Practical enlightenment

Based on the above analyses, this paper puts forward effective suggestions from the platform and government levels to strengthen user privacy protection, with the following specific measures:

At the platform level, e-commerce platform enterprises should be good at using the latest scientific and technological achievements to optimize their privacy protection functions and regulatory systems to prevent personal privacy leakage, improve user experience, and reduce privacy concerns; signing privacy protection agreements with users for specific functions and pushing out information about the privacy protection agreements at regular intervals, so that the users not only understand the relevant contents of the agreements but also increase their trust in the platform. At the same time, the privacy sensitivity of different personalities can be referred to, and targeted policies can be formulated; for example, consumers with strong openness and extroversion traits can be presented with more detailed platform privacy protection policies, and other actions can be taken to improve their overall willingness to protect their privacy.

At the government level, there should be further improvement in China's privacy protection-related systems. Legislations and judicial protection should be strengthened to effectively safeguard individual privacy from infringement. Simultaneously, government oversight of e-commerce platform companies should be intensified. Regular inspections of platform information storage systems should be conducted to prevent the occurrence of unlawful actions, such as the misuse of user personal information, contributing to the purification of China's overall internet environment.

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