Research on The Influence of Personalized Recommendation on Consumers' Purchasing Decision: The Mediating Role of Consumers' Privacy Concern

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Abstract

With the development of electronic commerce, consumers can enjoy the convenience brought by online shopping, but they also face problems such as information overload and privacy disclosure. This paper summarizes the personalized recommendation service of big data, consumers' purchase intention and consumers' privacy concern based on several literatures, and then, discusses the relationship between them and conducts empirical research. Research shows that personalized recommendation and consumer privacy concern have significant impact on purchase intention, privacy concern plays an intermediary role between personalized recommendation system and purchase decision. Finally, this paper also provides some reference suggestions for shopping websites' big data recommendation services to help improve consumers' shopping experience.

Keywords: *Personalized recommendation service, Consumer privacy, Buying decision Introduction*

1. Introduction

Recent years, with the popularization of Internet applications, more and more consumers adopt online shopping. Online shopping adds fresh elements to people's lives and becomes one of the mainstream consumption modes in today's society. However, consumers need to spend a lot of time to search for comparison when shopping online, and it is also very difficult for shopping websites and merchants to make their products stand out from dozens of pages of information   lists and be selected by consumers. In order to solve these problems, help consumers and businesses to solve the obstacles in online transactions, to achieve a win-win situation, personalized recommendation system is produced. Personalized recommendation system by collecting consumers on the web searches, traces, the degree of preference for products, brand preference, such as shopping evaluation data to consumers personalized, comprehensive, high frequency to provide recommendation information, help customers to find your satisfactory products faster, help customers to reduce information overload. However, consumers' attitude towards personalized recommendation system is not clear and may be affected by many factors in the process of accepting recommendation service. This paper studies personalized recommendation system from the perspective of influencing factors of consumers' purchase intention, summarizes relevant influencing factors, and further discusses the mediating role of

consumers' attention to privacy on this basis, so as to find a way to improve personalized recommendation system and achieve a win-win situation for consumers and businesses.

2. Theoretical Basis and Hypothesis

2.1. Personalized Recommendation

Research on personalized recommendation originated in the 1970s. Resnick [1] believed that personalized recommendation refers to e-commerce websites recommending products to consumers according to their own functions, enabling consumers to realize shopping guidance services without sales personnel. Some scholars have classified personalized recommendation systems, such as explicit feedback system and implicit feedback system according to the display degree of recommendation information [2], M Li et al [3] believed that the biggest characteristic of personalized recommendation system based on implicit feedback is that the data source is relatively invisible, and it is not easy to be found by consumers. It can browse the path and consumption behaviour in a way that consumers are not aware of, and there is no need to ask questions to consumers. This method is to collect the data information needed by the system in the dark, and it will not actively disturb consumers, and it is more convenient to operate. Therefore, the recommendation system based on implicit feedback is more widely used by the majority of shopping websites. When using the

recommendation system, consumers will generally choose products with similar brands or attributes to recommend according to the commodities they have purchased. The operation of content-based personalized recommendation is also not very complicated. First, a special file is built for consumers based on the history of shopping, and then through comparison, consumers are recommended to those products with the best match and the most similar.

2.2. Consumer privacy concerns

Implicit feedback recommendation systems often involve consumers' personal privacy. Therefore, Dinev and Hart et al. [4], studied consumers' privacy concerns, first put them in the context of the Internet. In addition, consumer privacy concerns are more specifically regarded as concerns about personal information security caused by the inevitable disclosure of personal information when consumers visit B2C websites voluntarily or involuntarily. Wang L X believed that consumers' privacy concerns are consumers' worries about how to use user information in the later period and whether it will have negative effects after shopping websites retain user information [5]. Therefore, when consumers provide information, they take privacy into account, which may lead to information concealment and distortion, thus affecting online transactions. For example, Bandyopadhyay [6] believed that consumers are reluctant to provide real personal information due to their concerns about privacy disclosure, which ultimately leads to the failure of the transaction.

In short, relevant scholars only studied the impact of consumer privacy concern on information provision and the negative impact on the final transaction when shopping online. Almost no scholars added mediating variables or moderating variables in their studies, or did not compare the results of direct and indirect effects, which also brought some limitations to the research results.

2.3. Research hypothesis

(1) Personalized recommendation and consumers' purchase intention

The study of Zhu Yan et al. showed that the intensity of personalized recommendation plays a crucial role in the acceptance of recommendation information [7]. Some scholars believed that the rationality and orderliness of information arrangement affect the efficiency of consumer decision-making to a great extent. We can conclude that the information arrangement of personalized recommendation system is reasonable and orderly, and the format conforms to the reading habit, which will bring better experience to consumers and enhance their purchase intention. When the frequency of recommendation intensity reaches a

certain level, the visiting effect will show a marginal decreasing effect. At the same time, the higher the recommendation intensity is, the more resistance and rejection will be generated by consumers, and the purchase intention will be reduced. Consumers seek the help of personalized recommendation system in order to find the target product more quickly. A certain information recommendation intensity can help consumers improve their familiarity with the product and give them more opportunities to complete the purchase behavior. The recommendation method of personalized information has a great relationship with consumers' purchase intention. Studies have found that associated recommendation can effectively enhance consumers' purchase intention, not only from users who have bought this product but also from other products, but also from relatives and friends. The ideal recommendation method should be targeted, accurate and will not cause trouble to users, which will help improve consumers' shopping experience. Therefore, this paper makes the following assumptions:

H1: Personalized recommendation information arrangement has a significant impact on consumers' purchase intention

H2: Personalized recommendation intensity has a significant impact on consumers' purchase intention

H3: Personalized recommendation has a significant impact on consumers' purchase intention

H4: Personalized recommendation system positively affects consumers' purchase intention

(2) Consumer privacy concerns and purchase intentions

Cockcroft and Heales found that consumers' privacy concern and purchase intention play a negative role in the mediating variable of risk [8]. Then we can know that when consumers shop on shopping websites, if they encounter personalized recommendations that they think infringe their privacy, their transaction intention will decrease accordingly. Eastlick and Lotz [9] believed that in the process of e-commerce, consumers' trust and loyalty play an intermediary role between privacy concern and purchase intention. In addition, Bettman's study revealed the positive correlation between the satisfaction of consumer needs and the satisfaction of consumers in the decision-making process [10]. However, when consumers who pay more attention to their privacy encounter personalized recommendation, they will think that the shopping website has violated their privacy, so it is difficult for them to buy the products they need on this e-commerce platform, thus failing to meet the needs of consumers. Based on this, this paper proposes that consumers' privacy concern plays an intermediary role in the relationship between personalized recommendation and consumers' purchase intention. The specific hypothesis is as follows:

H5: Consumers' privacy concern has a positive impact on consumers' purchase intention

H6: Consumers' privacy concern plays an intermediary role between each dimension of personalized recommendation and consumers' purchase intention

3. Data collection and analysis

3.1. Variable measurement and data collection

The questionnaire is divided into four parts: concept introduction, personal information, situation setting and questions. Likert5-level scale is adopted, with 1-5 representing completely, strongly disagree, disagree, uncertain, agree and completely agree respectively. Among them, the question design of variables is based on the maturity scale in previous studies. Paper questionnaires and electronic questionnaires were distributed at the same time to young people. There are 280 valid questionnaires actually obtained for data analysis in this survey. The age group is mainly distributed between 18 and 25 years old, accounting for 84.44%. They belong to the young group. In terms of educational background, most of the respondents were undergraduates, accounting for 72.28%, followed by those with master's degree or above, indicating that most of the respondents had bachelor's degree or above.

3.2. Data analysis

(1) Reliability and validity analysis: As shown in Table 1, the reliability and validity analysis results show that. Cronbach's A coefficients of the five variables were all greater than 0.7, indicating that the questionnaire had good reliability. Then, KMO and Bartlett sphericity tests were performed on the variable data, and the KMO values were all greater than 0.7, which could be used for factor analysis. Through factor analysis, the factor loading of all items is greater than 0.8, indicating that this questionnaire has good validity.

Table 1 Reliability and validity analysis results

variable	The number of multi-item	Cronbach's Alpha	KMO
Organising information	3	0.82	0.71
Recommended strength	3	0.83	0.84
Recommend ways	3	0.87	0.81
Privacy Concerns	4	0.79	0.78
Purchase intention	3	0.85	0.79

(2) Confirmatory factor and descriptive statistical analysis. As shown in Table 2, correlation analysis results between variables show that, the fitting indexes of the four-factor model are the best and all meet the standard. Then, Harman one-way variance test is used to find that the common method bias has little influence on the research model. In addition, correlation analysis was conducted.

Table 2 Correlation analysis

	Organising information	Recommended strength	Recommend ways	Privacy Concerns	Purchase intention
Organising information	1				
Recommended strength	.219**	1			
Recommend ways	.403**	.295**	1		
Privacy Concerns	.445**	.279**	.496**	1	
Purchase intention	.463**	.206**	.450**	.612**	1

Note: * p < 0.05, p < 0.01. * *

Table 3 Regression coefficients of personalized recommendation system and purchase intention

model		Non-standardized coefficient		Normalization coefficient	t	Sig.
		B	Standard error	A trial version		
	(variable)	.565	.310		1.820	.070
M1	Organising information	.588	.064	.596	2.945	.004
M2	Recommended strength	.266	.064	.268	.005	.000
M3	Recommend ways	.278	.067	.290	4.116	.000

(3) Multiple regression analysis. As shown in Table 3, the main effect analysis results show that, information arrangement, recommendation intensity and recommendation method had a significant positive impact on consumers' purchase intention (M1, B= 0.588,

P <0.001; M2, B= 0.266, P <0.001; M3, B=0.278, P <0.001), soH1, H2 and H3 are verified.

As shown in Table 4, regression results of personalized recommendation system and purchase intention show that, personalized recommendation and consumer privacy concern have a significant positive impact on consumers' purchase intention (M4, B= 0.666; M5, B= 0.624), so H4 and H5 are verified.

Table 4 Regression of personalized recommendation, privacy concern and purchase intention

variable		Personalized recommendation	Privacy Concerns	R^2	error	F	error
Purchase intention	M4	.666[a]		.427	.63177	27.707	2.292
	M5		.624[a]	.386	.52419	113.715	2.217

(4) Mediating effect test. As shown in Table 5, The comparison between Model 4 and Model 5 shows that, after adding consumer privacy concern into the independent variable, the adjusted R square increases from 0.427 to 0.517, and the difference rate of interpretation of the independent variable on purchase decision is improved, while the standardization coefficients of information arrangement, recommendation intensity and recommendation method are all reduced. It can be concluded that consumers' privacy concern acts as the intermediary influence of recommendation method and website image on consumption decision, and H6 is established.

Table 5 Test results of mediating influence of consumer privacy concern

	model 4			model 5		
variable	Normalization Beta	t	Sig	Normalization Beta	t	Sig
Organising information	.200	2.945	.004	.17	1.836	.028
Recommended strength	.285	.005	.000	.25	.439	.001
Recommend ways	.290	4.116	.000	.154	2.234	.027
Privacy Concerns	/	/	/	.390	5.766	.000
R^2	.427			.517		
F	27.707			32.908		
Dependent variable: Purchase decision						

4. Conclusions and Recommendations

Through empirical research, the paper draws the following conclusions:

(1) In big data driven personalized recommendation system, recommendation mode and information arrangement are the most influential factors for consumers' purchasing decisions, followed by recommendation intensity.

(2) Consumers' privacy concern is significantly affected by recommendation method, information arrangement and recommendation intensity, indicating that the optimization and improvement of these variables can win consumers' trust and play a positive role in users' privacy concern of shopping websites.

(3) Consumers' privacy concern, as an intermediary variable, has a great impact on consumers' purchasing decisions, which is consistent with the conclusions of existing literature and has a significant positive correlation with purchasing decisions. The variables of recommendation method, information arrangement and recommendation intensity of big data personalized recommendation system affect consumers' privacy concern, which plays an intermediary role and then influences consumers' purchasing decisions.

Based on the above conclusions, the author puts forward the following suggestions:

(1) The shopping website should optimize the information arrangement of the website to make it conform to the reading habits of consumers, so that consumers can quickly find the products they need, and improve the efficiency of consumers' purchasing decisions and satisfaction.

(2) Shopping websites should reduce the frequency of pop-up ads and make full use of new media platforms to provide consumers with personalized open-screen ads, video ads, and good things to share. So that consumers can receive more accurate push services, and then improve consumers' favorable impression of recommendation services.

(3) Shopping websites should study the boundaries of recommendation intensity and achieve moderate recommendation. At the same time, the recommendation intensity should focus on individuation and precision, so as to improve users' satisfaction when

browsing information and improve the efficiency of purchasing decisions.

Acknowledgments

References

[1] Resnick P, Varian H R. Recommender Systems. Communications of the ACM, 1997, 40(3): 56-58.

[2] Lee D H, Brusilovsky P. Reinforcing Recommendation Using Implicit Negative Feedback[C]// International Conference on User Modeling, Adaptation, and Personalization: Formerly Um and Ah. Springer-Verlag, 2009:422-427.

[3] Li M, Ogata H, Hou B, et al. Personalization in Context-aware Ubiquitous Learning-Log System[C]// IEEE Seventh International Conference on Wireless, Mobile and Ubiquitous Technology in Education. IEEE Computer Society, 2012:41-48.

[4] Dinev T, Hart P. Internet Privacy Concerns and Social Awareness as Determinants of Intention to Transact[J]. International Journal of Electronic Commerce, 2005, 10(2):7-29.

[5] Wang L X. Research on Internet Privacy C oncerns and Pro tective Behaviors Based on Social Trust. *J. Electronic Test.* 2013(24):64-65.

[6] Ukil A, Bandyopadhyay S, Joseph J, et al. Negotiation-based privacy preservation scheme in internet of things platform[C]// International Conference on Security of Internet of Things. 2012:75-84.

[7] Zhu Y.Lin Z N. Review of E - Business Recomm enda tion System *J. China Soft Science.*, 2009(02):183-192.

[8] Cockcroft S, Heales J. National culture, trust and internet privacy concerns[J]. Nephrology, dialysis, transplantation: official publication of the European Dialysis and Transplant Association - European Renal Association, 2005, 24(1):123.

[9] Eastlick M A, Lotz S L, Warrington P. Understanding online B-to-C relationships: An integrated model of privacy concerns, trust, and commitment[J]. Journal of Business Research, 2006, 59(8):877-886.

[10] Bettman, J. R. (1979). An information processing theory of consumer choice. Reading, MA: Addison-Wesley.