An Empirical Study on the Influencing Factors of Consumers' Personalized Recommendation Intention under Interpersonal Relationship

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Abstract. Based on the e-commerce network platform, based on the theory of TAM2 model and extended and modified it, a theoretical model of user personalized recommendation adoption was constructed from the perspective of user perception, in order to explore the influencing factors of e-commerce users' intention to use personalized recommendation.

A total of 265 valid answers were collected through questionnaire survey, and the hypothesis was verified by SPSS and AMOS software.

The results showed that several potential variables in interpersonal relationship were the main factors for the use intention, and the remaining variables also had a significant positive impact on the use intention.

Accordingly, relevant countermeasures and Suggestions are put forward for the improvement and perfection of personalized recommendation technology of e-commerce.

Keywords: Electronic Commerce, Personalized Recommendation, Adoption Behavior, Affecting Factors

Introduction

Since the beginning of the 21st century, China's e-commerce market has developed rapidly. According to the research report of iresearch, the transaction scale of China's online shopping market reached 1.44 trillion yuan in the third quarter of 2017 (Q3), with a year-on-year growth of 30.2%. Generally speaking, China's online shopping market is still in a state of stable growth. In the third quarter of 2017, the transaction scale of online B2C market was about 0.9 trillion yuan, accounting for 61.1% of the total, up 5.8% compared with last year. From the growth rate of 43.7% year-on-year growth, C2C year-on-year growth of 13.5%, overall B2C is still the network shopping market mainstream model. E-commerce has penetrated into people's lives and become an integral part of their lives. An important link in e-commerce is the personalized recommendation module, which can reduce information overload and enable users to improve the quality of decision making while saving search costs.

General recommendation systems focus on the browsing history and purchase history of users to push recommendation information, while the current personalized recommendation technologies mostly apply intelligent algorithms, such as collaborative filtering, to reduce the overload of information. However, no matter how perfect personalized recommendation is, users lack sufficient motivation to adopt personalized recommendation information in practical applications, so it is difficult for the recommendation service to reach the expected value of merchants. Sun jianjun [1] pointed out that the quality of the system itself is not completely the same as whether consumers accept the recommendation. The latter is more related to the emotional factors among users. So this article from the perspective of interpersonal relationship, the application technology acceptance theory, design a model to describe the relationships in a personalized for the users to accept the influence, and through the data statistical analysis and structural equation model to verify whether a hypothesis, calculated the relationship under the influence users to accept the influence factors of the personalized recommendation intention.

Related research review

Technology acceptance theory. TAM [2] is changed from the theory of rational behavior to adapt to the appearance of information system. It is used to predict the adoption and use of information technology by individuals in their work. The content is shown in the figure.



Figure 1. TAM Model

Through observation, it can be found that the perceived usefulness in the technology acceptance model inherits the essence of behavioral attitude variables in the rational behavior theory and reflects that individuals will take actions under the influence of interests. Perceived ease-of-use in technology acceptance model inherits the connotation of perceived behavior control variable in planned behavior theory [3]. It should be noted that subjective normative variables do not appear in the technology acceptance model. In addition, perceived usefulness and perceived ease of use have indirect effects on behavioral intention, and attitude of use plays an important mediating role. The technology acceptance model also reveals the important role of external variables, which will affect the perceived usefulness and perceived ease of use of use of users. As TAM model is relatively comprehensive and concise in revealing the process of user technology adoption, it has become a typical model in this field.

At present, the research on personalized recommendation adoption is mainly based on the technology acceptance theory, and the core idea is that the important factors influencing the users' willingness to adopt are perceived usefulness and perceived ease of use respectively. Among them, perceived ease-of-use explains the reasons influencing users' behavioral intention from the perspective of system and technology, while perceived usefulness reflects the reasons influencing users' behavioral intention from the perspective of users' perception, such as psychology and emotion[3]. Therefore, I chose TAM model as the basis for studying the user's willingness to adopt under interpersonal relationship. Secondly, it can be seen from the research of different theories on personalized recommendation adoption willingness that the number of TAM models is far more than other models, which is also the basis for most scholars to believe that the theoretical model of technology acceptance

has the greatest impact. By determining the influencing factors, this paper evaluates the quality of personalized recommendation based on the feedback from users' subjective adoption behavior, which is conducive to exploring new areas and improving the accuracy of personalized recommendation algorithm.

personalized recommendation adoption study. Davis et al. [4], based on the theory of rational behavior, put forward that the central connotation is that the important factors influencing the user's adoption intention are perceived usefulness and perceived ease of use respectively.

With the more and more extensive application of personalized recommendation related technology in the field of e-commerce, it has gradually become a hot phenomenon, attracting the attention of many management scholars. Many people take consumer behavior as the focus, and explore the influencing factors of the adoption, purchase decision and willingness of personalized recommendation users.

Disha et al. [5] and Legris et al. [6] proposed that subjective norms, including organizational and social factors, also affect technology adoption intentions.

Sun jianjun et al. [1] believed that user psychology and other factors would affect their adoption of recommendations.

Some scholars summarized the influence of recommendation system characteristics on adoption intention from the perspective of recommendation system characteristics, such as perceived usefulness, perceived ease of use and other intermediate variables, with user characteristics and product characteristics as moderating variables. However, they have not conducted empirical research (zhang luping, 2016).

Gaudi (2017) defined service quality in the successful model of information system as interaction quality, including system interaction quality and user interaction quality, and empirically analyzed the influence of information quality, system quality, interaction quality, perceived usefulness and perceived ease of use on adoption intention [7].

From the perspective of users, Yang yiweng and other scholars established a conceptual model to reveal the factors that influence the marketing effect of the recommendation system on users, which are the characteristics of the shopping website and the recommendation system [8].

In terms of user adoption, it can be seen that the improvement of human-computer interaction and other related functions of the recommendation system can effectively improve the user's acceptance of recommendations.

In addition, scholars also studied other aspects of technology adoption behavior. A. a. Shaikh et al. [9] based on the technology acceptance model revealed that perceived usefulness and attitude are important factors influencing the adoption behavior of mobile Banks.

Chen Yue et al. [10] studied the risk model, in which the risk of online shopping mode and its impact on users' behavioral intention were analyzed in detail.

In summary, most scholars focus on the performance and recommendation algorithm of the recommendation system, while few pay attention to the influence of interpersonal relationship, trust and other factors on the adoption willingness, which is the main research problem and key in the field of social business.

Research on Social Business. Relevant theories of socialized consumption point out that the definition and characteristics of socialized commerce are mainly studied from sociology [11], psychology [12] and other aspects. Komiak et al. demonstrated through experiments that trust and emotional factors increase consumers' intention to adopt personalized recommendations [13].Feng jiao et al. believe that the essence of social commerce is a relational business model that conducts business

activities through social relations and social media [14].According to liu pingfeng et al., compared with traditional e-commerce, social commerce mainly includes interaction and recommendation of friends, and professionalism of community and recommendation of friends [15].According to behavioral science, people often adjust their attitudes, beliefs and behaviors by referring to their networks.

Research on Interpersonal Relationship. However, good interpersonal communication should follow the principles of honesty and trustworthiness, equality, mutual respect, mutual assistance and mutual benefit. If the principles of interpersonal communication are violated, it is often not welcomed or even trapped in communication difficulties. Mark Granovetter is the initiator of the concept of relationship strength. In his book the strength of weak relationships, he divided interpersonal relationships into strong relationships and weak relationships, and distinguished the strength of relationships by the degree of emotional involvement, the interaction frequency between the two parties, the degree of intimacy between the two parties, and the degree of reciprocal exchange between the two parties [16]."Interaction" has long been considered an important part of how users form connections and maintain social networks.(Pauline E.W. van den Berg, Theo a. Arentze, Harry J.P. Timmermans, 2012) [17]. Tao xiaobo found that interactive behavior is the key element of social business by collecting Elsevier, ESI and other databases [18]. Cooperation and reciprocity will have an effect on interpersonal relationship in the continuous interaction [19]. It can be seen that reciprocity is an important factor in good interpersonal relationship. The researcher who first proposed the norm of reciprocity is Goudlner(1960). He believes that the norm of reciprocity is a universal basic tendency that has existed for a long time in human society. The norm of reciprocity: a person should help those who have helped him in the past and retaliate against those who have harmed his interests in the past [20].In conclusion, based on the research of existing scholars, this paper selects emotion, interpersonal interaction and reciprocity as the variables affecting consumers' behavioral intention in social business.

Models and Assumptions

Model Construction. The model proposed in this paper is based on TAM2 model with appropriate modifications and supplements, and defines external influencing factors in combination with the characteristics of social business. Perceived variables refer to the perceived effect of users on personalized recommendation, mainly including perceived usefulness and perceived ease-of-use. In this research framework, according to the behavioral characteristics under the social consumption theory, we also introduced relevant variables in social behavior, such as emotion and interpersonal interaction, as research variables in interpersonal relationship. In addition, recommendation accuracy is also an element of perceived usefulness [36].In addition, perceived ease of use includes recommended transparency, interaction design, interaction interface, etc. Next, we will define each variable according to the characteristics of mobile e-commerce recommendation system and put forward the research hypothesis.

Model Hypothesis. According to behavioral science, people often use their social networks to adjust their attitudes, emotions, and behavior. Wang weijun believes that users will internalize the belief of good relationship with themselves into their own belief, thus significantly improving their recognition of perceived usefulness [21]. That is to say, interpersonal relationship will affect people's behavioral intention through affecting perceived usefulness. Literature [22] believes that emotional factors are one of the main components of interpersonal relationships. Goleman (1997) also pointed out that emotional cognition and the ability to properly handle interpersonal relationships are also part of intelligence. Literature [59-8] believes that interactive behavior is an important factor influencing

people's behavior in social commerce. Literature [23] believes that reciprocity plays an important role in interpersonal relationships. Trust among social members has a significant effect on their participation behavior [24].Users are more likely to take advice from people they trust, and are more likely to share information with members of society they trust [25].Improving the matching degree between recommended commodities and users' needs and preferences can improve users' perceived usefulness [26].Therefore, this paper summarizes social business behavior and relevant factors in behavioral science as the theoretical basis for studying behavioral intention under interpersonal relationship. Based on the above literatures, the text proposes the following hypotheses:

H1 emotion has a significant positive impact on perceived usefulness.

- H2 interaction has a significant positive effect on perceived usefulness.
- H3 reciprocity has a significant positive effect on perceived usefulness.
- H4 Perceived usefulness had a significant positive effect on adoption intention. In addition.

many scholars in the field of personalized recommendation is based on the study of technology acceptance model and its extension, everyone thinks concise page, flexible interaction function, the user can modify according to their own preferences and interests recommended goods, use this recommendation system make users feel easy and thus improve their adoption intention of mobile telephone business recommendation system. Song hui (2011) supplemented TAM model with the positive influence of user interaction degree and system interaction design on perceived ease-of-use [27].Sukai et al. concluded that factors such as consumer experience, perceived risk and interaction degree would influence the quality of consumer decision-making [28].According to ye qunlai's research, consumers' familiarity with the recommendation system and the recommendation transparency obtained from the characteristics of the system will affect their perception of the recommendation system have a significant impact on the recommendation effect. It should be easier for the target user to make a decision if the recommendation itself clearly states which friend of the target user has a comment on the item. In conclusion, this paper selects interaction design and recommendation transparency as the influencing factors of perceived ease of use and makes the following assumptions:

H5 recommendation accuracy has a significant positive impact on perceived ease of use.

H6 system interaction has a significant positive impact on perceived ease of use.

H7 recommended transparency has a significant positive effect on perceived ease of use.

H8 perceived ease of use has a significant positive impact on adoption intentions.

H9 Perceived ease of use has a significant positive impact on perceived usefulness.

Model Construction. The model based on the modified technology acceptance model (TAM2) and the hypothetical relationship between recommendation system features, social business features, and adoption intentions is as follows, as shown in figure 2.1.



Figure 2. Personalized Recommendation User Adoption Intention Model Under Interpersonal Relationship

Research Methods

First, the measurement items of each variable were extracted on the basis of each reference to form the initial scale. Secondly, the scale was modified by organizing scholars in the same field. Then, a small-scale pre-test experiment was conducted among 50 users with rich mobile shopping experience, and some items were modified according to their Suggestions to ensure the accuracy of the scale description. Finally, the formal questionnaire was formed through repeated modification and refinement.Likert5 subscale was used where 1 means "totally disagree" and 5 means "totally agree".

The data were collected online, and most of the respondents were college students and white-collar workers, because their shopping needs were relatively high. Finally, 265 valid responses were recovered after some questionnaires were deleted (if there were missing values or all questions were the same).

Research results

According to the two-step method proposed by Anderson [34], reliability and validity were first measured, and then relevant model assumptions of the structural model were tested. SPSS 20.0 and AMOS 21.0 were used in this study.

Validity and Reliability

In order to ensure the validity of the scale, exploratory factor analysis (EFA) was conducted on the sample data with the spindle factor method of maximum variance rotation, and KMO value was used to judge whether the sample data was suitable for factor analysis. The KMO value of the sample data in this study is 0.911, and the table name data is suitable for principal component analysis. Table 1 shows the factor load matrix after maximum rotation of variance. The load of each index on the corresponding factor is much larger than the cross load of other factors, which proves that each index can effectively

reflect its corresponding factor and ensures a good scale validity.

Rotation component matrix ^a									
					To scale	e			
					constitue	nt			
	1	2	3	4	5	6	7	8	9
QG1	.094	.0	.8	.1	.0	.1	.1	.0	.1
		31	78	16	89	04	29	79	37
QG2	.127	.0	.8	.1	.0	.0	.1	.0	.1
		71	77	48	65	86	11	83	73
QG3	.112	.1	.8	.0	.0	.0	.1	.0	.1
		49	68	47	52	70	50	36	86
HD1	00	.0	.1	.0	.0	.1	.0	.1	.8
	2	48	37	98	01	18	87	55	24
HD2	.036	.0	.1	.0	.0	.0	.0	.1	.8
		86	44	34	38	69	04	18	68
HD3	.148	.0	.1	.0	.1	.0	.0	.0	.7
		74	73	83	72	16	53	18	90
HH1	.115	.8	.0	.0	.0	.1	.1	.0	.0
		44	73	34	24	12	24	46	75
HH2	.031	.9	.0	.0	.0	.0	.0	.1	.0
		43	65	77	87	51	33	17	83
HH3	.059	.9	.0	.0	.0	.0	.0	.1	.0
		26	88	50	80	30	44	25	51
ZQD1	.151	.0	.1	.8	.2	.2	.1	.1	.0
-		81	03	23	31	33	47	59	71
ZQD2	.140	.0	.1	.8	.1	.2	.1	.1	.0
-		71	70	36	79	04	88	93	97
ZQD3	.165	.0	.1	.8	.1	.2	.1	.1	.1
-		54	08	44	55	33	81	92	14
JHD1	.106	.1	.0	.1	.1	.1	.1	.8	.1
		21	32	41	29	75	09	51	73
JHD2	.179	.1	.0	.2	.1	.1	.2	.7	.0
		11	73	34	81	41	41	95	80
JHD3	.162	.1	.1	.1	.1	.1	.2	.8	.1
		29	26	52	78	13	02	32	10
TMD1	.041	.0	.0	.2	.0	.8	.1	.1	.0
		69	83	11	91	56	29	63	72
TMD2	.145	.0	.1	.1	.0	.8	.0	.1	.0
		68	08	61	79	44	85	32	58
TMD3	.103	.0	.0	.1	.0	.8	.0	.0	.0
-		70	66	57	72	66	95	75	88
YOX1	.244	.0	.1	.2	.1	.1	.8	.2	.0

 Table 1 Rotation component matrix

		74	46	06	99	78	14	04	33
YOX2	.224	.1	.1	.1	.2	.0	.8	.2	.0
		15	74	63	11	97	37	10	71
YOX3	.227	.0	.1	.1	.2	.1	.8	.1	.0
		88	85	74	08	29	21	77	88
YIX1	.851	.0	.1	.1	.2	.1	.2	.1	.0
		84	46	43	37	34	10	46	61
YIX2	.868	.1	.1	.1	.1	.0	.2	.1	.0
		03	18	70	89	86	35	44	80
YIX3	.835	.0	.1	.1	.2	.1	.1	.1	.0
		77	34	31	68	35	96	61	85
SYYY1	.252	.0	.1	.1	.7	.1	.1	.1	.0
		88	26	98	98	03	73	64	88
SYYY2	.273	.0	.0	.1	.8	.0	.1	.1	.0
		67	41	26	53	81	69	62	54
SYYY3	.144	.0	.0	.2	.8	.0	.2	.1	.1
		78	68	08	19	95	06	51	07

In this study, confirmatory factor analysis was used to further test the reliability and validity of the scale, and the results were shown in table 3.In order to check the internal consistency of the measurement items in the table, the composite reliability CR and alpha values could be measured and both of them were greater than 0.7, which confirmed the good reliability of the scale.

Cronbach Reliability Analysis						
Name	(CITC)	Alpha coefficients deleted	Cronbach α			
QG1	0.809	0.888				
QG2	0.884	0.825	0.913			
QG3	0.786	0.909				
HD1	0.714	0.816				
HD2	0.713	0.812	0.856			
HD3	0.765	0.768				
HH1	0.642	0.621				
HH2	0.555	0.717	0.785			
HH3	0.573	0.693				
ZQD1	0.721	0.883				
ZQD2	0.805	0.81	0.884			
ZQD3	0.801	0.812				
JHD1	0.766	0.873				
JHD2	0.839	0.81	0.895			
JHD3	0.78	0.863				
TMD1	0.651	0.797				
TMD2	0.761	0.69	0.829			
TMD3	0.654	0.8				

YOX1	0.794	0.898	
YOX2	0.857	0.846	0.911
YOX3	0.825	0.87	
YIX1	0.86	0.9	
YIX2	0.892	0.875	0.931
YIX3	0.826	0.927	
SYYY	0.862	0.009	
1	0.805	0.908	
SYYY	0.807	0.88	0.035
2	0.897	0.88	0.955
SYYY	0.830	0.028	
3	0.839	0.928	

Table 3 KMO and Bartlett test results of each	dimension
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		Kaiser	-Meyer-Olkin	.744
		Bartl	The approximate	428.379
	ett		chi-square	
			df	3
Emotion			Sig.	.000
		Kaiser	-Meyer-Olkin	.686
		Bartl	The approximate	250.229
	ett		chi-square	
			df	3
Interaction			Sig.	.000
		Kaiser	-Meyer-Olkin	.702
		Bartl	The approximate	369.072
	ett		chi-square	
			df	3
Reciprocal			Sig.	.000
		Kaiser	-Meyer-Olkin	.738
		Bartl	The approximate	396.418
	ett		chi-square	
Recommend			df	3
ation accuracy			Sig.	.000
		Kaiser	-Meyer-Olkin	.738
		Bartl	The approximate	396.852
	ett		chi-square	
Human-com			df	3
puter interaction			Sig.	.000
Recommend		Kaiser	-Meyer-Olkin	.714
ation		Bartl	The approximate	255.432
transparency	ett		chi-square	

			df	3
			Sig.	.000
		Kaiser	-Meyer-Olkin	.730
		Bartl	The approximate	383.533
	ett		chi-square	
			df	3
Perceptual			Sig.	.000
		Kaiser	-Meyer-Olkin	.744
		Bartl	The approximate	439.039
	ett		chi-square	
Perceived			df	3
ease of use			Sig.	.000
		Kaiser	-Meyer-Olkin	.745
		Bartl	The approximate	522.125
	ett		chi-square	
Intention of			df	3
usage			Sig.	.000

Hypothesis Test. In this paper, AMOS is used to calculate the path coefficient of the structural model to test whether the hypothesis is valid. The goodness of fit index and the corresponding acceptable values are shown in table 5. Important fitting indexes are all within the range of acceptable suggested values, indicating that the theoretical model and empirical data have a high degree of fitting.

Fitting Index								
	Chi-square/degree	R	N	C	Ι	G		
	of freedom	MSEA	FI	FI	FI	FI		
Acceptable	2.5	<0.	>	>	>	>		
Recommended Values	2~3	05	0.80	0.80	0.80	0.80		
Madal Etting Value	1.57	0.0	0	0	0	0		
Model Fitting value	1.57	47	.897	.959	.96	.888		

Table 4 Goodness of fit index results of structural model

The results show that all the hypotheses are verified except H9.Perceived usefulness and perceived ease of use have significant positive effects on usage intention, supporting hypothesis H4 and H8.Emotion, interaction and reciprocity significantly positively affect perceived usefulness, which verifies H1,H2 and H3.The effects of accuracy, transparency, and system interaction on perceived ease of use were also verified.



Figure 3 Hypothesis test results of structural equation

Conclusion

Based on the theory of TAM2 model research on the mobile user adoption behavior in the personalized recommendation is one of the significant characteristics for the formation of the mobile Internet environment will be perceived usefulness further decomposition, makes the macroscopic, highly summarized the influencing factors in personalized recommendation information technology on the perspective of the definition and decomposition. First of all, through the comparisons of the path coefficient, known factors such as emotion, interaction, mutually beneficial is the user think whether personalized recommend products or services meet the demand, the main factors in the related demand satisfaction with friends around the transfer to the user, for goods to be able to enhance the user perceived usefulness, and thus enhance the adoption intention; The second is perceived ease of use, that is, whether the use of the recommendation system can meet some user habits and needs. If the use of the system itself has a big problem, it will also have a certain impact on the user's adoption of the recommendation information in the system, and finally affect the use intention.

As can be seen from the path coefficient, interpersonal relationship variables, namely, the coefficients of emotion, interaction and reciprocity, are the largest. That is to say, users' intention to use personalized recommended products or services is affected by users' evaluation of perceived usefulness, while perceived usefulness is mostly affected by interpersonal relationship variables. Perceived ease-of-use is an influence factor proposed based on TAM2 model theory. Since personalized recommendation technology has all the characteristics of general information system, whether it can be smoothly and skillfully mastered by mobile users can significantly affect users' usage intention for personalized recommendation products.

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