Based on Technology Acceptance Model and risk preference theory Study on Farmers' willingness to use agricultural social service platform and its influencing factors ——Take planting households in Shaanxi Province as an example

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Abstract. To explore the willingness and influencing factors of farmers to use agricultural socialized service platform, so as to provide scientific basis for improving the scientificity, pertinence and effectiveness of agricultural socialized service platform. Based on the micro survey data of 253 farmers in Heyang County and Dali County, Shaanxi Province, and based on the technology acceptance model (TAM) and risk preference theory, this paper empirically analyzes the influencing factors of farmers' willingness to use agricultural socialized service platform. Perceived usefulness and perceived ease of use have a very significant positive impact on Farmers' use intention. At the same time, risk preference has a moderating effect between perceived ease of use and use intention. The degree of network involvement has a positive impact on the use intention of growers by affecting the perceived ease of use, and the degree of government incentive policies, social networks and part-time industrialization have a positive impact on the use intention of growers by affecting the perceived usefulness. Based on the above conclusions, the corresponding policy enlightenment is obtained.

Keywords: agricultural socialized service platform; Willingness to use; TAM; Risk appetite.

1. Introduction

The construction of the agricultural socialization service platform is based on technologies such as the Internet and the Internet of Things to provide supply and demand matching channels for small farmers, emerging agricultural business entities and agricultural socialization service providers. important measures. my country has issued a series of policies to support the development of agricultural social service platforms in towns and villages.

Agricultural socialized service is to provide socialized services before, during and after production for agricultural production. Agricultural socialized service can effectively implant elements such as science and technology, capital, information and talents into the whole chain of agricultural production. It is an important part of modern agriculture. Agricultural socialized service system is an important starting point to promote the revitalization of rural industries and promote the organic connection between small farmers and the development of modern agriculture. However, although some areas have relatively perfect agricultural socialized organization systems, due to information asymmetry, fresh fruit growers in most areas lack the awareness of actively seeking to use agricultural socialized services. Even if they have demand, it is difficult to quickly find agricultural socialized service suppliers. Therefore, there is still much room for improvement in the promotion of agricultural socialized service platform in China. Analyzing the use intention and influencing factors of farmers' agricultural socialized service platform is the primary task of continuing to develop agricultural socialized service platform.

2. Related work

Technology Acceptance Model (TAM) was proposed by American scholar Davis [1] on the basis of rational behavior theory in 1989. The model is widely used to study the acceptance and use of new information technology. Its robustness and operability have been confirmed by many literatures [2].

Tam is based on perceived usefulness (PU) and perceived ease of use (PEOU). Perceived ease of use represents the ease of using technology in an individual's subjective consciousness, and perceived usefulness represents the degree to which an individual believes that using technology can improve work performance [3]. With the continuous introduction of new information systems, many domestic scholars have analyzed users' use intention and influencing factors based on TAM [4].

Risk preference theory: risk preference is the attitude of decision-makers towards risk, which refers to the degree of tolerance to the uncertainty of events in the process of achieving a certain goal [5-7]. The famous Nobel laureate arrow divides individual risk preference into three types: risk aversion, risk neutrality and risk preference. Risk preference decision-makers have great ability to bear risks and are willing to pursue risks; Risk averse decision makers are risk averse and have less ability to bear risks; Risk neutral decision makers are between the two, neither avoiding risks nor actively pursuing risks [8-9]. Many scholars have studied the risk preference of Chinese growers. For example, Zhou Bo divides the risk preference of large growers into three types: risk preference, risk neutrality and risk aversion based on Roger risk diffusion theory [10]; According to the investigation and analysis of growers in 38 counties of Guangdong Province, Yu Mingxia divided the risk preference of growers' willingness to use agricultural technology into conservative type, risky type and intermediate type [11]; According to the analysis of the questionnaire results of farmers in Xinjiang, Hu Yiting divided the attitude of farmers towards risk into three types: risk aversion, risk neutrality and risk preference [12]. In addition, considering the long production cycle of agricultural products and the long time interval between farmers' production decision and product harvest, farmers' decision-making is accompanied by complex and diversified risks, and farmers with different risk preference types will take different actions when facing the same scenario. For example, WIK found that their risk preferences are diversified in the study of Zambian farmers' risk preference [15], combined with the risk preference theory, This study introduces risk preference, a variable describing the degree of individual preference for risk [16], to explore its regulatory role in perceived ease of use and use intention, perceived usefulness and use intention.

3. Research models and assumptions

In order to study the use intention and influencing factors of agricultural socialized service platform, this paper integrates the risk preference theory into Tam and constructs a more comprehensive research model. The specific model is shown in Figure 1.

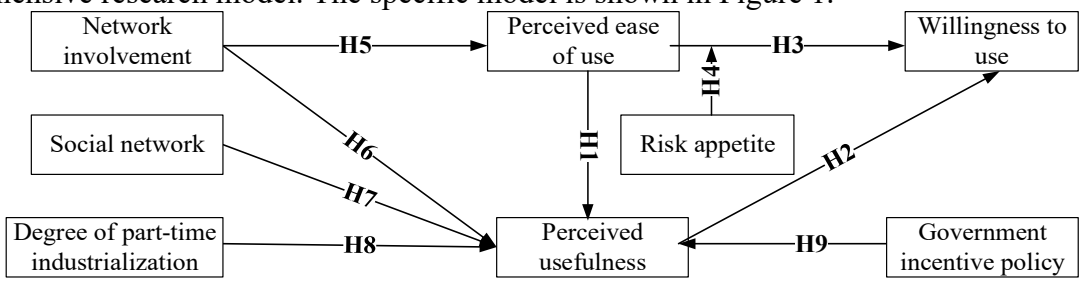


Figure 1 research model

4. Empirical analysis

4.1 Reliability and validity test

In this study, SPSS 23.0 and Amos 22.0 were used for data processing. As shown in Table 1, Cronbach's α The values are greater than 0.7. The combined reliability analysis using the standardized

factor load value shows that the CR values of each dimension are greater than 0.7, so the questionnaire has good reliability.

Table 1 confirmatory factor analysis results

facet	measure item	factor loadings	AVE	combined reliability（CR）	Cronbach's α
Perceived ease of use（POE）	POE1	0.982	0.964	0.991	0.990
	POE2	0.985			
	POE3	0.990			
	POE4	0.970			
Perceived usefulness（PU）	PU1	0.968	0.903	0.979	0.979
	PU2	0.983			
	PU3	0.916			
	PU4	0.941			
	PU5	0.941			
Willingness to use（UI）	UI1	0.742	0.794	0.938	0.919
	UI2	0.956			
	UI3	0.976			
	UI4	0.871			
Risk appetite（RA）	RA1	0.920	0.786	0.917	0.767
	RA2	0.857			
	RA3	0.881			
Network involvement（NI）	NI1	0.985	0.982	0.995	0.995
	NI2	0.987			
	NI3	0.994			
	NI4	0.997			
Social network（SN）	SN1	0.848	0.817	0.957	0.938
	SN2	0.847			
	SN3	0.957			
	SN4	0.950			
	SN5	0.910			
Government incentives（GIP）	GIP1	0.884	0.805	0.943	0.940
	GIP2	0.969			
	GIP3	0.891			
	GIP4	0.839			
Sideline activity（SA）	SA1	0.991	0.880	0.967	0.938
	SA2	0.992			
	SA3	0.764			
	SA4	0.895			

The standard factor load values of each measure term are 0.742 ~ 0.973, which is significant at the level of 0.01, and the average extracted variance value ave of each dimension is greater than 0.5. The model has good convergence validity. As shown in Table 2, the square root of ave of each facet is greater than the person correlation coefficient of adjacent facets, indicating that each facet has good differential validity.

Table 2 test results of discriminant validity

	POE	PU	UI	RA	NI	SN	GIP	SA
POE	0.982							
PU	0.496	0.950						
UI	0.642	0.689	0.891					
RA	0.299	0.184	0.282	0.887				
NI	0.426	0.388	0.442	0.072	0.991			
SN	0.036	0.059	0.053	0.012	0.021	0.904		
GIP	0.286	0.343	0.404	0.175	0.276	-0.006	0.897	
SA	0.416	0.293	0.404	0.273	0.460	-0.022	0.438	0.938

4.2 Path test of structural model

Firstly, the overall fitting degree of the structural model is evaluated, and its fitting indexes are χ^2/ df=2.208、CFI=0.946、GFI=0.923、NNFI=0.937、NFI=0.935。 All fitting indexes meet the requirements, and the fitting degree of the model is good. As shown in Table 3, the test results of model path parameters are shown. Except that H6 and H7 assumptions fail to pass the test, other assumptions are verified, and the absolute values of statistically significant standardized path coefficients are greater than 0.2, indicating that the corresponding assumptions are meaningful.

Table 3 path coefficient of structural equation model and corresponding hypothesis test

Assumption	path relationship	normalized path coefficients	S.E.	P	Whether the hypothesis is verified
H1	POE→PU	0.569	0.047	***	approved
H2	PU→UI	0.404	0.057	***	approved
H3	POE→UI	0.281	0.054	**	approved
H5	NI→POE	0.459	0.051	***	approved
H6	NI→PU	0.250	0.049	0.366	unapproved
H7	SN→PU	0.244	0.057	0.402	unapproved
H8	SA→PU	0.239	0.049	*	approved
H9	GIP→PU	0.272	0.054	***	approved

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

4.3 Analysis on the regulatory effect of risk preference

SPSS 23.0 was used to conduct regression analysis on the sample data to test the regulatory effect of risk preference on perceived ease of use and use intention. The independent variable and the regulatory variable were standardized to avoid collinearity. The standardized independent variable and the regulatory variable Z score were multiplied to obtain the cross multiplication term. Using the hierarchical regression method, the results are shown in Table 5. It can be concluded that risk preference has a significant regulatory effect on perceived ease of use and use intention, and individuals with low risk preference have a greater impact on perceived ease of use.

Table 4 Analysis of regulatory effect of risk preference

Models and Variables	outcome variable		
	model1	model 2	model 3
Sex	-0.041	-0.043	-0.068
Age	0.078	0.086	0.100
Education	0.122	0.117	0.140*
Perceived ease of use		0.450**	0.430**
risk appetite		0.075	0.059
Perceived ease of use * risk appetite			-0.160**
R^2		0.233	0.257
$\triangle R^2$		0.005	0.024

Note: * * indicates P < 0.01, * indicates P < 0.05.

In order to more intuitively reflect the regulatory role of risk preference, the regulatory variables are divided into high and low groups (mean plus or minus one standard deviation), and the impact of perceived ease of use on use intention under the high and low groups of risk preference is tested respectively, as shown in Figure 2.

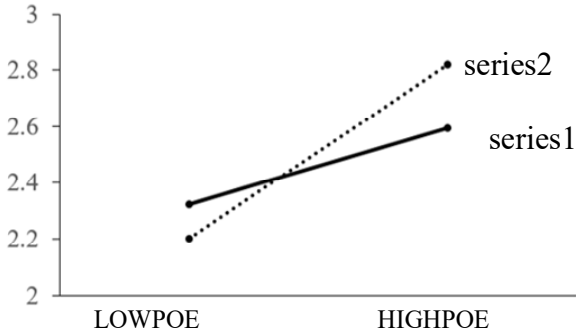


Figure 2 the role of risk appetite in perceived ease of use and willingness to use

4.4 Mediating effect analysis of perceived usefulness

In this paper, the nonparametric percentile bootstrap method of deviation correction is used to test the intermediary path. The repeated sampling is 5000 times, and the confidence interval is 95%. If the obtained confidence interval contains 0, the corresponding mediation path is not significant. On the contrary, if the obtained confidence interval does not contain 0, the mediation effect of the test is significant. The model results constructed in this paper are shown in Table 6. The total effect of perceived ease of use on use intention is 0.429. In the path of perceived ease of use - perceived usefulness - use intention, the mediation effect value of perceived usefulness is 0.262, the boot standard error is 0.051, 95% CI = [0.173,0.373], and the mediation effect accounts for 61.17% of the total effect. Therefore, the mediation effect of this path is significant.

Table 5 breakdown of total effect, direct effect and intermediary effect

	Effect size	Boot standard error	Boot CI lower limit	Boot CI upper limit	Relative effect size
total effect	0.429	0.061	0.309	0.549	
mediation effect	0.262	0.051	0.173	0.373	61.17%
direct effect	0.167	0.075	0.020	0.313	38.83%

5. Research conclusions and suggestions

This paper takes three counties and districts in Shaanxi Province as the research object, takes TAM model as the theoretical basis, makes an empirical analysis on the influencing factors of farmers' willingness to use agricultural socialized service platform, uses structural equation model to determine the key factors affecting farmers' willingness to use, and draws the following research conclusions.

(1) Perceived usefulness and perceived ease of use have significant positive effects on use intention, which are significant at the level of 1% and 5% respectively.

(2) Perceived ease of use, government incentive policies and the degree of part-time industrialization all have a significant positive impact on perceived usefulness.

(3) Risk preference has a moderating effect between perceived ease of use and use intention, and perceived usefulness has a significant mediating effect between perceived ease of use and use intention.

Based on the above research, the following suggestions are drawn.

(1) Efforts have been made to make the operation of the platform simple and easy to understand. Perceived ease of use is the key factor affecting the willingness to use. Therefore, it is very important to avoid the complexity of platform operation and the inability of growers with low network involvement to learn how to use the platform, so that growers can quickly learn how to use the platform.

(2) Implement different promotion strategies for different groups. According to the research results, the lower the risk preference of growers, the greater the impact of perceived ease of use on perceived usefulness. Therefore, firstly, we should use measurement tools to accurately grasp the risk preference of potential users and classify them, and carry out publicity with different emphasis for different classified groups, which will help to improve the use intention.

(3) The government encourages the introduction of relevant policies. The government's incentive policies have a significant positive impact on perceived usefulness. Therefore, the government should issue incentive policies in line with local conditions after scientific investigation to actively guide growers to use the platform.

(4) Select the growers with high degree of part-time industrialization and high social network score as the initial users. The higher the degree of part-time industrialization and the higher the score of social network, the more likely the planters are to have higher perceived usefulness. Therefore, it is an effective method to select this kind of population to open the market for the initial users and then drive other users to use it.

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References

[1] Davis, D F. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology[J]. MIS Quarterly,3(13):319-340.

[2] Lu Jiaojiao, sun Jianbin Summary of empirical research on domestic technology acceptance model [J] Journal of Gannan Normal University, 2013,34 (06): 89-93

[3] Xu Xiangdong, he Dandan An empirical study on the influencing factors of Library mobile service use intention -- a technology acceptance model based on variables such as information security perception and mobility [J] Library, 2019 (02): 79-85

[4] Jiang Hongbo, Zhang Wenli, Shao Ting, et al Research on users' willingness to use government data open platform [J] Journal of Xiamen Institute of technology, 2021,29 (04): 33-40

[5] Shang Wei Research on College Students' Entrepreneurship with internet financing based on TAM / TPB model [J] Rural economy and technology, 2018,29 (19): 120-126

[6] Wu Liang, Shao Peiji, Sheng Xudong, et al Empirical Study on Internet of things service adoption based on improved technology acceptance model [J] Management review, 2012,24 (03): 66-74

[7] Jiang fengjuan, Liu Xiaoxuan Research on the influencing factors of teachers' willingness to use information technology in Ethnic Minority Areas -- an analysis based on TAM [J] Research on ethnic education, 2021,32 (03): 78-86

[8] Xie bin, Lin Yijun, Guo Xunhua Research on Influencing Factors of mobile banking user adoption [J] Nankai management review, 2009,12 (03): 12-19

[9] Chen Qin, Qi Ming Pricing decision considering risk preference and value analysis of demand information sharing [J] Industrial Engineering, 2015,18 (05): 64-73

[10] Zhou Bo, Zhang Xu Empirical Analysis on risk preference of large rice farmers in agricultural technology application -- Based on the survey of 1077 farmers in Jiangxi Province [J] Journal of agriculture and forestry economics and management, 2014,13 (06): 584-594

[11] Yu Mingxia, Qi Li An empirical study on the application risk of modern agricultural technology -- Based on the survey of farmers in Guangdong Province [J] Guangdong agricultural science, 2012,39 (21): 218-221

[12] Hu Yiting, Pu Zuoyi Analysis on risk attitude and influencing factors of farmers in planting industry in Xinjiang [J] Journal of Shihezi University (PHILOSOPHY AND SOCIAL SCIENCES EDITION), 2011,25 (03): 1-6

[13] Xiong Ying, Guo Yaohui, Du Xingduan, et al Risk preference of Chinese Rice Growers: theoretical model and quantitative calculation [J] Chinese agronomy bulletin, 2018,34 (08): 138-139

[14] Gao Yang, Niu Ziheng Analysis on risk aversion, information acquisition ability and farmers' adoption behavior of green prevention and control technology [J] China rural economy, 2019 (08): 109-127

[15] Wik, M., Holden, et al. Experimental studies of peasant's attitudes toward risk in Northern Zambia[J]. Diskusjonsnotater fra IOES, 1998.

[16] Zang Wenru Research on the consumption and use behavior of credit card of the new generation of migrant workers [J] Agricultural technology and economy, 2015 (02): 95-108