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User Satisfaction of Traceability System for Agricultural Product Quality Based on Integrated TAM-IS Model

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Abstract:

User satisfaction of the system has an important impact on local governments to continuously promote the traceability system for agricultural product quality. In this study, based on the theoretical model of integrated TAM-IS model, partial least squares method is used to analyze the influencing factors and mechanism of information system and government support to the quality traceability system of navel orange in southern Jiangxi Province by using the survey data of 197 users of Gannan navel orange quality traceability system. The results show that perceived ease of use has a positive and significant impact on perceived usefulness; system quality has a positive and significant impact on perceived usefulness; perceived usefulness plays an intermediary role in the impact of system quality on user satisfaction; perceived ease of use and perceived usefulness have a positive and significant impact on user satisfaction, which are the main factors affecting the use of user quality traceability system; government support has a positive and significant impact on user satisfaction, which is an important factor driving users to use the quality traceability system continuously. Therefore, it is recommended that governments at all levels strengthen the system construction of the quality traceability system, improve the perceived usefulness and perceived ease of use of the system, so as to meet the needs of users, and further improve the satisfaction of users of Gannan navel orange quality traceability system.

Keywords*: Gannan navel orange, Quality traceability system, Satisfaction, Influencing factor.*

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I. INTRODUCTION

The traceability system of agricultural product quality, as an important application of information technology in the field of agriculture, provides government departments with the basis for quality and safety supervision and decision-making support.Gannan orange quality traceability system, which is vigorously promoted by Ganzhou Fruit Bureau of Jiangxi Province, also plays an important role in the healthy development and quality and safety control of navel orange industry in southern Jiangxi Province.

Research on user acceptance and use of information management systems is a hot topic in the field of management information system at home and abroad [1-3].The cognition of users on quality traceability system, quality expectation of information system and income expectation are key variables in the implementation of agricultural product quality traceability system (as a component of information management system), which affect their satisfaction with quality traceability system and determine their willingness to continue using it.Therefore, it is of theoretical and practical significance to study the satisfaction of users on the quality and safety traceability system of agricultural products, and to explore the main influencing factors and mechanisms.

In this paper, based on the domestic and foreign research, firstly, PLS analysis method is used to study the Gannan navel orange quality traceability system by using the data of 197 individual users of it; then, the relevant variables are determined by constructing an integrated TAM-IS model for the users satisfaction on Gannan navel orange quality traceability system; and finally corresponding research hypotheses are made to analyze the system quality, information quality, service quality, perceived usefulness and perceived ease of use, as well as government support, the impact and mechanism of user satisfaction of Gannan navel orange quality traceability system, to verify the effect of integrated TAM-IS model on the interpretation of user satisfaction of the system.

II. LITERATURE REVIEW

The TAM model was proposed by Davis in 1989 and has been widely used in the study of influencing factors of technology adoption.The TAM model proposes and validates that the intention of information system use behavior is mainly determined by perceived usefulness and attitudes toward using, while perceived ease of use significantly affects perceived usefulness and attitudes toward using.TAM model has been widely used in various technical occasions to explain and predict the influencing factors that users initially adopt, and to determine the

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micro-mechanism between belief, attitude, intention and behavior [3].

The information system success model (IS model), also known as D&M model, is an information system evaluation model proposed by DeLon and McLean in 1992, which constructs the conceptual framework of information system success or failure, mainly including six aspects, information quality and system quality for information system evaluation, personal and organizational impact at individual and organizational levels, as well as system use and user satisfaction. Since the initial model could not meet the needs of social development, DeLon and McLean updated the D&M model in 2003 and made "Service Quality (SEQ)" a new dimension for the success of information systems, and further improved the definition of the dimension, as well as the integration of related dimensions [4].

System Quality is generally considered as the user's perception of the system; Information Quality is generally considered as the quality of information generated by the system; Service Quality reflects the quality of service provided by the service provider to the user; User Satisfaction refers to the degree to which the information system meets the users' needs; Use refers to the users' willingness to use the information system; Net Benefits refers to the impact of the information system on individuals, groups, organizations, industries, society, etc., usually measured by organizational performance, perceived usefulness and impact on work practices. The three dimensions of information quality, system quality and service quality together affect user satisfaction and use; user satisfaction and use interact with each other and affect net benefits; net benefits in turn affect user satisfaction and use.

Some scholars integrate IS success model with other theories in the hope of better explaining users' satisfaction with information systems and their continuous use behavior. The idea of integrating IS success model with TAM model originated from Seddon, who examined the relationship among information quality, system quality, use and user satisfaction in IS success model in his research on some tests and development of IS success model, and changed the use to perceived usefulness in TAM model. Perceived usefulness problem settings in Seddon's empirical study all originated from Davis. The results show that three factors, information quality, system quality and perceived usefulness, account for a large proportion of the difference in user satisfaction (more than 70% in Seddon's study), and these three factors have a high degree of correlation. Wang Zuzhu and Wu Lei [5] conducted an empirical study on professional virtual communities in social network services, and concluded that perceived usefulness in the integration model is significantly affected by information quality and system quality, as well as perceived ease of use, and corresponds to the hypothetical relationships in the integration model.

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III. VARIABLES AND HYPOTHESES

3.1 Operational Definition of Variables

Based on the integrated TAM-IS model, System Quality (SYQ), Information Quality (IQ), Service Quality (SEQ), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Government Support (GS) and Satisfaction (SAT) are used in this study as research dimensions to explore the main factors affecting user satisfaction of Gannan Navel Orange Quality Traceability System.Specific definitions of variables are shown in TABLE I:

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TABLE I. Operational Definition of Research Variables

Variable name	Variable definitions	Literature source
SYQ	User's evaluation of the quality traceability system itself, including system availability, stability, timeliness, etc	Yang Yiweng et al[6]；Wang Wentao et al[7]
IQ	User's recognition of the accuracy, completeness and timeliness of the service information provided by the quality traceability system, etc	Wang Wentao et al[7]
SEQ	Whether the operator can provide stable and convenient consulting services and management services for individual users	Wang Wentao et al[7]
PEOU	Users think how easy it is to learn and be able to master the quality traceability system	Zhang Yaming [8]；Yang Honglin [9]
PU	The extent to which users believe that the quality traceability system is helpful to the management and monitoring of the production and sales process of Gannan navel orange	Zhang Qingjie and Gong Hanshi[11]
GS	Some help provided by the government to users when they use the quality traceability system is mainly reflected in spiritual encouragement, financial support, and training.	Hu Fangxiao[12]

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SAT	User satisfaction with the quality traceability system	Zhang Yuwei et al.[13]

3.2 Hypotheses

3.2.1System Quality, Information Quality and Perceived Usefulness

PU represents the degree to which persons believe that a system can bring benefits to them. According to D&M theory, SYQ and IQ are decisive factors affecting user satisfaction and indirect factors affecting net benefits. Therefore, when users think that the higher the quality of information system, the higher the perceived usefulness of information system.Wei Sha [14] studied information system behavior based on TAM model and concluded that the strong correlation coefficient between IQ and SYQ and PU is about 0.7.From the perspective of integration of TAM model and IS model, Xu Zhuoyu et al [15]hypothesized and tested the positive and significant impact of SYQ and IQ on PU. Thus, the following two hypotheses are made:

H1: SYQ has a positive and significant impact on PU.

H2: IQ has a positive and significant impact on PU.

3.2.2 System Quality, Information Quality, Service Quality and Perceived Ease of Use

Based on the integrated model of TAM and IS, Zhu Duogang and Guo Junhua [16] found that SYQ has a significant impact on perceived ease of use. Empirical studies by Wang Fan [17] and Zhang Pei [18] all validated the significant impact of SYQ and IQ on perceived ease of use. Wei Sha [14] and Li Haojun [19] validated the positive and significant relationship between service quality and perceived ease of use. Thus, the following three hypotheses are made:

H3: SYQ has a positive and significant impact on PEU.

H4: IQ has a positive and significant impact on PEU.

H5: SEQ has a positive and significant impact on PEU.

3.2.3 Perceived Usefulness, Perceived Ease of Use, and Satisfaction

Satisfaction is a person's inner feeling. To a large extent, customer satisfaction represents whether an information system can successfully serve customers and bring benefits to them. In the TAM model, subjective variables, namely PU and PEU, are correlated with satisfaction [20].

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Empirical research conducted by Zong Wei [21] found that PU has a significant positive impact on satisfaction, but the impact of PEU on satisfaction is not supported. Thus, the following two hypotheses are made:

H6: PU has a positive and significant impact on satisfaction.

H7: PEU has a positive and significant impact on satisfaction.

3.2.4 Perceived Usefulness and Perceived Ease of Use

The significant impact of perceived ease of use on PU has been widely verified in the TAM model and its extended models. Many scholars have agreed that the PEU of system users will positively affect their perceived usefulness, which has been verified by most scholars [22,23]. Thus, the following hypothesis is made:

H8: PEU has a positive and significant impact on PU.

3.2.5 Government Support, Perceived Usefulness and Satisfaction

Government support refers to the spiritual encouragement, financial support and technical training provided by the government for peasant households. A study by Hu Fangxiao [27] showed that the more help the government gives, the more satisfied farmers are [26]. Thus, the following two hypotheses are made:

H9: Government support has a positive and significant impact on PU

H10: Government support has a positive and significant impact on satisfaction.

3.2.6 Mediating Role of Perceived Usefulness

In the above assumptions, SYQ and IQ positively affect the PU of users, while perceived usefulness also has a positive and significant impact on satisfaction, indicating that perceived usefulness may play a mediating role in the impact of SYQ and IQ on user satisfaction. Zhu Duogang and Guo Junhua [16] used TAM model as theoretical framework to empirically test that SYQ and IQ have a positive and significant impact on PU, and then positively affect user satisfaction. Thus, the following two hypotheses are made:

H11: SYQ has a positive and significant impact on satisfaction through PU.

H12: IQ has a positive and significant impact on satisfaction through PU.

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3.3 Modeling

In this study, an integrated theoretical model of user satisfaction of Gannan navel orange quality traceability system is constructed (as shown in Fig 1) based on the TAM model and IS model and combined with previous studies. The integrated model takes SYQ, IQ, SEQ and government support as independent variables, and PU and PEU as mediating variables to explore system user satisfaction and influencing factors. Among the hypotheses of the integrated model, SYQ and IQ affect PU; SYQ, IQ, SEQ affect PEU; PEU affects PU; PU and PEU both affect satisfaction; government support affects both PU and satisfaction.

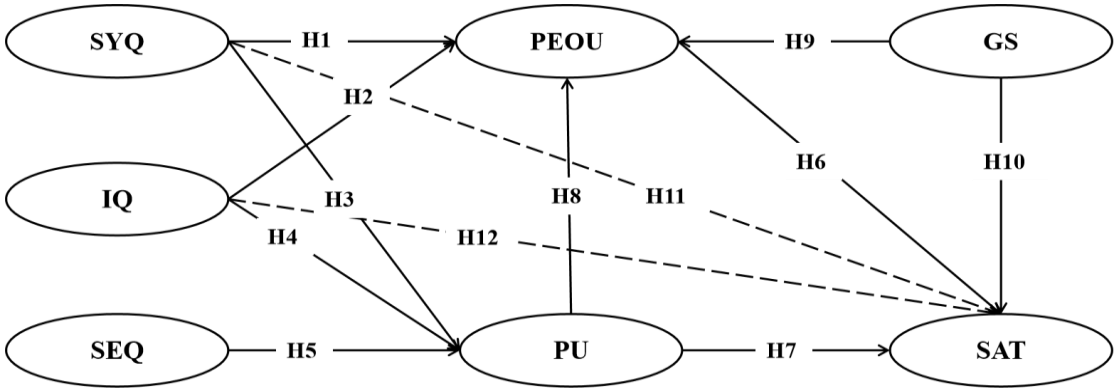

Fig 1: TAM-IS Success Integration Theoretical Model

Note: The solid line represents the main effect, the dashed line represents the mediating effect

IV. RESEARCH DESIGN

4.1 Research Subjects

The subjects of this study are users who have used the Gannan navel orange quality traceability system for more than one year in 18 counties and districts in Ganzhou City, Jiangxi Province. In order to ensure the quality of the survey, 35 users were randomly selected for pre-survey, and the relevant problems were modified and improved accordingly. The formal survey was conducted through the 2019 User Training Conference of Gannan Navel Orange Quality Traceability System organized by the Fruit Industry Bureau of Ganzhou. 245 questionnaires were sent out to the trainers, and 207 questionnaires were collected. Excluding the invalid ones, 197 valid questionnaires were obtained in this survey, with a 95.16% recovery rate.

4.2 Questionnaire Design

The questionnaire had such items as users' demographic information, business scale, income,

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system quality, information quality, service quality, user perception, government support and satisfaction. Each item was measured with Likert seven-level scale, where 1 is strongly disagreed, 2 is disagreed, 3 is somewhat disagreed, 4 is uncertain, 5 is somewhat agreed, 6 is strongly agreed, and 7 is strongly agreed. The questionnaire design still follows the 4 steps of "initial measurement items designed by reference → small-scale interview for correction → small-scale reliability and validity test → revision and formation of the final questionnaire".

4.3 Sample Characteristics

The survey adopted a combination of questionnaire survey and typical user interviews, and eventually recovered 197 effective samples. 5 questions about the basic information of farmers were set up in the questionnaire, including: gender, age, education level, planting area and income. The survey found that farmers are mainly male, 140 people, accounting for 71.1% of the total number, 57 women, accounting for 28.9% of the total number, and the ratio of male and female is close to 7:3. The majority of farmers are middle-aged, in which 20 people under the age of 30 account for 10.2% of the total number, 83 people between the age of 30-39 account for 42.1% of the total number, 84 people between the age of 40-49 account for 42.1% of the total number, and 10 people over the age of 50 account for 5.1% of the total number. The education level is mainly high school and junior college, of which 1 person with elementary school education, accounting for 0.5% of the total number, 10 people with junior high school education, accounting for 5.1% of the total number, 95 people with high school education, accounting for 48.2% of the total number, and 91 people with college education or above, accounting for 46.2% of the total number. The planting area is mainly 30-199mu, including 2 people under 10mu, accounting for 1.0% of the total population, 6 people with 10-29mu, accounting for 3.0% of the total, 60 people with 30-49mu, accounting for 30.5% of the total, 91 people with 50-199mu, accounting for 46.2% of the total, and 38 people over 200mu, accounting for 19.3% of the total. Income is more than 300,000 yuan, including 10 people with income less than 100,000 RMB, accounting for 5.1% of the total, 26 people with income of 100,000-29,000 RMB, accounting for 13.2% of the total, 57 people with income of 300,000-500,000RMB, accounting for 28.9% of the total, 61 people with income of 500,000-1 millionRMB, accounting for 31.0% of the total, 43 people with income of more than 1 millionRMB, accounting for 21.8% of the total. The details are shown inTABLE II:

TABLE II. Basic information of the respondents

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Variable	Variable interpretation	Frequency/person	proportion/%
Gender	Male	140	71.1
	Female	57	28.9
Age/year old	<30	20	10.2
	30~39	83	42.1
	40~49	84	42.6
	≧50	10	5.1
Education level	Primary school	1	0.5
	Junior high school	10	5.1
	High school	95	48.2
	College degree and above	91	46.2
Planting area/mu	<10	2	1.0
	10~29	6	3.0
	30~49	60	30.5
	50~199	91	46.2
	≧200	38	19.3
Income/Ten thousand	<10	10	5.1
	10~29	26	13.2
	30~50	57	28.9
	50~100	61	31.0
	>100	43	21.8

V.DATA ANALYSIS

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PLS analysis method is a statistical method that integrates a principal component structure with the linear of variables and uses the regression principle to test the relationship between the principal components, and makes prediction and interpretation. PLS can be used to explore theoretical models or to validate the causal relationships of the inferences discussed, and it can also obtain good estimates when small samples or data are not normally distributed. Therefore, SmartPLS.3.2.9 software was used for statistical analysis in this study.

5.1 Descriptive Statistics for Categorical Variables

TABLE III shows the mean, standard deviation, skewness and peak of the main variables. The questionnaire presents the options in the form of Likert seven-level scale. When the mean value of the measurement item data is greater than 6 or less than 2, it means that the data of the measurement item is too centralized and lacks discrimination and should not be used. TABLE III shows that the mean values of all measurement items are between 5 and 6, indicating that the data are good and workable. Standard deviation reflects the difference between the detected value and the true value of sample data, which is shown in TABLE III hovering around 1, indicating that the data is relatively stable and acceptable. Sample data skewness coefficient greater than 3 and peak coefficient greater than 8 indicate a deviation from normal distribution. The skewness coefficient of each variable in this study is less than 3 and the peak coefficient is less than 8, which indicates that the sample data conforms to the normal distribution.

TABLE III. Descriptive Statistics of Category Variables

Measure	Mean	Standard deviation	Skewness	Kurtosis
SYQ1	5.766	0.896	-0.899	1.063
SYQ2	5.756	0.899	-0.607	0.289
SYQ3	5.640	0.993	-0.582	-0.122
SYQ4	5.807	1.007	-0.513	-0.410
IQ1	5.843	0.909	-0.711	0.225
IQ2	5.579	0.909	-0.380	-0.116

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IQ3	5.746	0.890	-0.530	0.050
IQ4	5.949	0.825	-0.455	-0.304
SEQ1	5.812	0.920	-0.569	-0.225
SEQ2	5.325	1.146	-0.458	-0.266
SEQ3	5.665	0.953	-0.500	-0.202
SEQ4	5.858	0.869	-0.756	0.562
GS1	5.848	0.800	-0.805	1.163
GS2	5.213	1.210	-0.435	-0.405
GS3	5.949	0.919	-0.816	0.543
PEOU1	5.447	1.108	-0.978	1.228
PEOU2	5.091	1.234	-0.488	-0.317
PEOU3	5.218	1.155	-0.957	1.034
PEOU4	5.447	1.099	-0.609	0.290
PU1	5.975	0.906	-0.865	0.918
PU2	5.929	0.848	-0.675	0.562
PU3	5.239	1.044	-0.166	-0.206
PU4	5.305	1.020	-0.115	-0.632
PU5	5.954	0.784	-0.624	0.634
SAT1	5.787	0.884	-0.599	0.193
SAT2	5.523	0.890	-0.531	0.945
SAT3	5.706	0.900	-0.738	0.736
SAT4	5.873	0.820	-0.714	0.854

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5.2 Analysis on Measurement Model

5.2.1 Questionnaire Reliability Analysis

The reliability of the questionnaire is measured by means of measurement tools, and the measurement results are required to be consistent or stable. In this study, the α coefficient (i.e. Cronbach's Alpha) was used to measure the reliability of the questionnaire. The larger the measured α-factor, the higher the reliability of the questionnaire, that is, the credibility of the questionnaire, and the higher the stability of the questionnaire. Devellis considered that it is better to delete if the measured α coefficient is between 0.70 and 0.80 indicates that the questionnaire reliability is quite good; α coefficient value between 0.80 and 0.90, indicates that the questionnaire reliability is very good.It can be seen from TABLE IV that the α coefficients of the seven facets of SYQ, IQ, SEQ, PU, PEOU, GS, and SAT are 0.837, 0.793, 0.803, 0.758, 0.860, 0.766, and 0.841, respectively, which are all above 0.7. The reliability of the questionnaire is good.

TABLE IV. Questionnaire Reliability

Variable	Cronbach's α
SYQ	0.837
IQ	0.793
SEQ	0.803
PU	0.758
PEOU	0.860
GS	0.766
SAT	0.841

5.2.2 Convergence Validity Analysis

Questionnaire validity, that is, the validity of the questionnaire, refers to the use of

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measuring tools or means to accurately measure the extent to which things need to be measured. In this study, confirmatory factor analysis will be used to test and analyze the questionnaire validity, to verify convergence validity and discriminant validity.

In the convergence validity test, according to the recommendation of Hair in the validity evaluation, the absolute value of standard factor load estimation should be at least above 0.5, the Average Variance Extracted (AVE) index value should be above 0.5, and the Composite Reliability (CR) index should be higher than 0.7 to show that the measurement model has good convergence validity.

TABLE V. Convergent Validity

Variable	Item	Standard factor loading	CR	AVE
SEQ	SEQ1	0.816	0.871	0.630
	SEQ2	0.689		
	SEQ3	0.832		
	SEQ4	0.828		
SYQ	SYQ1	0.826	0.891	0.671
	SYQ2	0.787		
	SYQ3	0.850		
	SYQ4	0.811		
IQ	IQ1	0.829	0.866	0.619
	IQ2	0.672		
	IQ3	0.788		
	IQ4	0.846		

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GS	GS1	0.848	0.864	0.682
	GS2	0.722		
	GS3	0.897		
PEOU	PEOU1	0.825	0.905	0.706
	PEOU2	0.757		
	PEOU3	0.887		
	PEOU4	0.886		
PU	PU1	0.719	0.838	0.51
	PU2	0.700		
	PU3	0.665		
	PU4	0.656		
	PU5	0.820		
SAT	SAT1	0.830	0.894	0.677
	SAT2	0.775		
	SAT3	0.826		
	SAT4	0.859		

TABLE V shows that the standard factor load of each measurement item under SYQ, IQ, SEQ, PEOU, PU, GS and SAT is above 0.5, and the CR value of each dimension is greater than 0.7, and the AVE value is greater than 0.5. Therefore, the measurement model has better convergence validity.

5.2.3 Discriminant Validity

Discriminant validity refers to that when different methods are used to measure different dimensions, the observed values should be distinguished, so as to show that the measurements of each dimension are not similar and repeated, and can be distinguished well.

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TABLE VI. Discriminant Validity

	IQ	PU	GS	PEOU	SEQ	SAT	SYQ
IQ	0.787						
PU	0.505	0.714					
GS	0.498	0.495	0.826				
PEOU	0.386	0.498	0.344	0.840			
SEQ	0.739	0.519	0.491	0.395	0.794		
SAT	0.635	0.628	0.608	0.473	0.615	0.823	
SYQ	0.742	0.489	0.461	0.469	0.706	0.646	0.819

Note: The diagonal is the square root of AVE

In the discriminant validity test, the method proposed by Fornell-Larcker is used to test whether the square root of AVE is higher than the correlation coefficient of two factors to determine whether there is discriminant validity. TABLE VI shows that the correlation coefficients of SYQ, IQ, SEQ, PEOU, PU, GS and SAT, and the square root of AVE are larger than its corresponding correlation coefficient, so the measurement model has better discriminant validity.

5.3 Analysis on Structural Model

5.3.1 PLS Test Criteria

The test criteria for PLS direct effect are as follows:

PLS analysis method is used to test the hypotheses. Generally, P-value and confidence interval are used to judge whether the hypothesis passes the test, mainly with the confidence interval. At 95% confidence level, when $P < 0.05$, the confidence interval does not include 0, indicating that the hypothesis relationship is valid and passes the test; otherwise, it fails the

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empirical test and the hypothesis is false. The non-standardized coefficient represents the path coefficient (b), which is used to measure the multiple relationship between hypotheses. For every 1 unit increase in the independent variable, the dependent variable or mediator variable will increase b units, and the greater the value of the correlation coefficient (b), the greater the influence of the independent variable. R^2 represents the explanatory power of variables, and the larger the number, the stronger the explanatory power. When R^2> 0.67, it indicates that the hypothetical relationship of the model is of practical value; when R^2= 0.33 or so, the model has medium explanatory power; and when R^2 = 0.19 or so, the model has weak explanatory power.

The test methods and criteria for PLS mediating role are as follows:

If a variable (Me) is both an independent variable (X) and a dependent variable (Y), that is, (X) affects (Y) through (Me), then Me is called a mediating variable in the research model. Mediator variables are variables that are closer to outcome variables than predictors and are themselves causal (endogenous) variables. Mediating effect refers to the effect of independent variables affecting dependent variables through mediator variables. Indirect effect is tested by means of mediator variables, including causal step mediating effect test, indirect effect coefficient product test and indirect effect bootstrap test.

5.3.2 Direct Effect Test

TABLE VII reflects the direct effect test results of the partial least squares structural equation model, including the non-standardized coefficients, standard errors, T statistics and P values within each hypothesis. The Bootstrapping estimation method of SmartPLS3.2.9 software is used, in which the number of Bootstrapping is 5000.

TABLE VII. Direct Path

Path relationship	Non-standardized coefficient	Standard deviation	T Statistics	P value	Bias-corrected 95%	
					Lower limit	Upper limit
SYQ→PU	0.091	0.103	0.884	0.377	-0.103	0.306

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IQ→PU	0.192	0.105	1.836	0.066	-0.029	0.384
SYQ→PEOU	0.340	0.106	3.216	0.001	0.119	0.538
IQ→PEOU	0.016	0.132	0.121	0.903	-0.242	0.273
SEQ→PEOU	0.165	0.127	1.296	0.195	-0.085	0.409
PU→SAT	0.361	0.077	4.693	0.000	0.203	0.514
PEOU→SAT	0.165	0.094	1.751	0.080	-0.011	0.362
PEOU→PU	0.292	0.071	4.111	0.000	0.149	0.427
GS→PU	0.257	0.071	3.628	0.000	0.120	0.396
GS→SAT	0.373	0.078	4.796	0.000	0.210	0.518

Note: 95% confidence level

The direct effects of categorical variables are as follows:

TABLE VIII. Hypothesis Test Results of Category Variables

Assumed serial number	Hypothetical relationship	Path coefficient b	P value	Confidence interval	Test result
H1	SYQ→PU	0.091	0.377	-0.103~0.306	Fail to pass
H2	IQ→PU	0.192	0.066	-0.029~0.384	Fail to pass
H3	SYQ→PEOU	0.340	0.001	0.119~0.538	Pass
H4	IQ→PEOU	0.016	0.903	-0.242~0.273	Fail to pass
H5	SEQ→PEOU	0.165	0.195	-0.242~0.273	Fail to pass

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H6	PU→SAT	0.361	0.000	0.203~0.514	Pass
H7	PEOU→SAT	0.165	0.080	-0.011~0.362	Fail to pass
H8	PEOU→PU	0.292	0.000	0.149~0.427	Pass
H9	GS→PU	0.257	0.000	0.120~0.396	Pass
H10	GS→SAT	0.373	0.000	0.210~0.518	Pass

Note: 95% confidence level

At confidence of 95%, TABLE VIII shows:

(1) SYQ and IQ have a significant impact on PUat 0.5 and 0.1 levels, respectively, with path coefficients b of 0.091 and 0.192, confidence intervals of (-0.103-0.306) and (-0.029-0.384) including 0, indicating that H1 and H2 fail to pass the test;

(2) SYQ has a significant impact on perceived ease of use PEOU at the level of 0.001, with a path coefficient of 0.340 and confidence interval of (0.119-0.538) including 0, indicating that H3 is valid;

(3) IQ and SEQ have a significant impact on perceived ease of use PEOU at 1 and 0.5 levels, with path coefficients of 0.016 and 0.165, respectively, and confidence intervals of (-0.242-0.273) and (-0.242-0.273) including 0, indicating that H4 and H5 fail to pass the test;

(4) PU has a significant impact on SAT at the level of 0.001, with a path coefficient of 0.361 and the confidence interval of (0.203-0.514) excluding 0, indicating that H6 is true;

(5) PEOUhas a significant impact on SAT at the level of 0.001, with a path coefficient of 0.165 and the confidence interval of (-0.011-0.362) including 0, indicating that H7 is false;

(6) PEOU and GS have a significant impact on perceived usefulness, with path coefficients of 0.292 and 0.257, confidence intervals of (0.149-0.427) and (0.120-0.396) excluding 0, indicating thatH8 and H9 are true;

(7) GS to SAT is significant at the levels of SYQ, IQ, PEOU and GS, with a path coefficient of 0.373 and confidence interval of (0.210-0.518) excluding 0, indicating that H10 is true.

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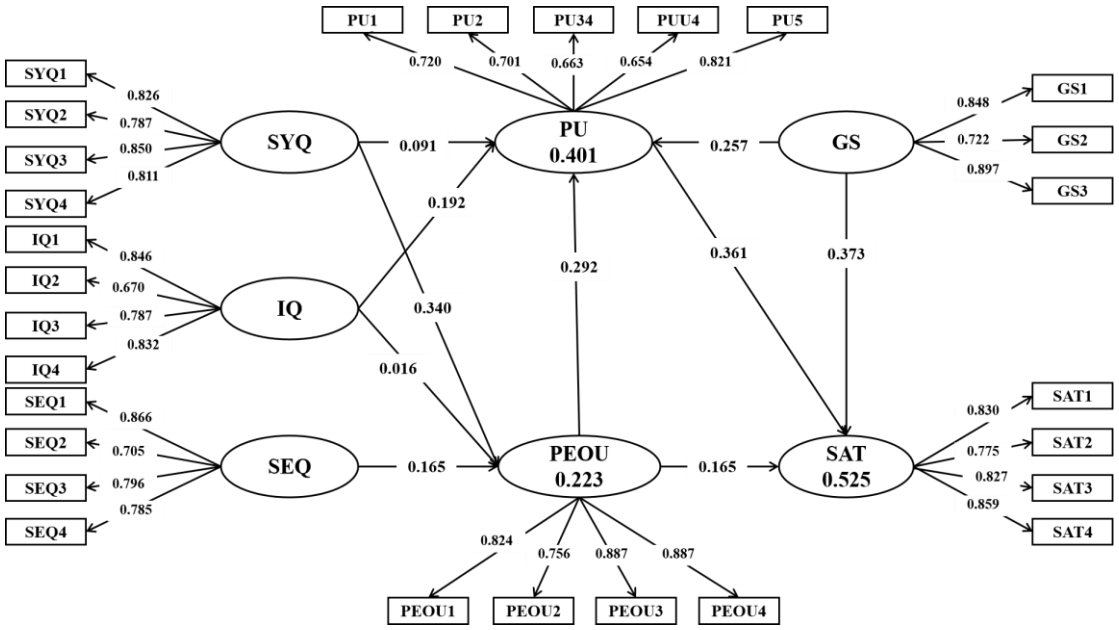

Fig 2: Path Map of TAM-IS Success Integration Model

The explanatory power of categorical variables is as follows:

Fig 2 is the path map of the user satisfaction model of Gannan navel orange quality traceability system based on TAM-IS, which reflects the path relationship between the direct hypotheses and the explanatory power of variables.

Fig 2 shows that:

(1) When the perceived usefulness of users increases by 1, the user satisfaction will increase by 0.361, and the rest of the path relationships will be the same;

(2) System quality, information quality, perceived ease of use and government support jointly explained the 40.1% variance of perceived usefulness, and the impact on perceived usefulness ranks from large to small in order of perceived ease of use, government support, information quality, and system quality; system quality, information quality and service quality jointly explained the 22.3% variance of perceived ease of use, and the impact on perceived usefulness ranks from large to small in order of system quality, service quality and information quality; perceived usefulness, perceived ease of use and government support jointly explained 52.5% variance of satisfaction, and the impact on perceived usefulness ranks from large to small

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in order of perceived usefulness, government support and perceived ease of use.

5.3.3 Mediating Effect Test

The Bootstrap method is a uniform sampling put back from the original sample without the need for indirect effects to follow a normal distribution. Hayes recommended that at least 1,000 samples should be repeated, with an ideal number of 5,000. If repeated for 5,000 times, the indirect effect will have 5,000 estimates. The 5,000 times of indirect effect will form its own sampling distribution, so the standard error and confidence interval of indirect effect can be generated. TABLE IX shows the total effect and indirect effect results of categorical variables.

TABLE IX. Total and Indirect Effects

Effect	Non-standard coefficient	Standard deviation	T statistics	P value	Bias-corrected 95%	
					Lower limit	Upper limit
Total effect: SYQ→SAT	0.125	0.051	2.444	0.015	0.032	0.229
Indirect effects: SYQ→PEOU→PU→SAT	0.036	0.016	2.177	0.030	0.013	0.080
Total effect: IQ→SAT	0.074	0.050	1.487	0.137	-0.014	0.177
Indirect effects: IQ→PEOU→PU→SAT	0.002	0.015	0.113	0.910	-0.030	0.029

Note: 95% confidence level

TABLE X reflects the mediating effect results of categorical variables.

TABLE X. Intermediate Effect Test Results

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Assumed serial number	Hypothetical relationship	Total effect	P value	Confidence interval	Effect size	Test result
H11	SYQ→PEOU→PU→SAT	Pass	0.030	0.013~0.080	0.036	Pass
H12	IQ→PEOU→PU→SAT	Not pass	0.910	-0.003~0.165	0.002	Not pass

Note: 95% confidence level

TABLE IX shows the magnitude and significance of the mediating hypothesis. The specific relationship is as follows:

In the total effect of "SYQ →SAT", P<0.05, and the confidence interval (0.032-0.229) does not include 0, indicating that the total effect is true. In the corresponding indirect effect "SYQ →PEOU→PU →SAT", P<0.05, the confidence interval (0.013-0.080) does not include 0, indicating that the indirect effect is true.

In the total effect of "IQ →SAT", P>0.05, and the confidence interval (-0.014-0.177) includes 0, indicating that the total effect is false, and the corresponding mediating effect does not exist and is not necessary to be discussed.

In summary, among the two mediating hypotheses in this study, H11 is true and H12 is false, that is, system quality can positively affect user satisfaction by affecting perceived ease of use PEOUandPU; however, information quality cannot positively affect user satisfactionby affectingPEOUandPU.

VI. CONCLUSIONS AND SUGGESTIONS

In this study, PLS model was used to analyze the influencing factors and mechanism of customer satisfaction with Gannan navel orange quality traceability system by building an integrated TAM-IS theoretical model based on the user survey data of 197 users. A total of 10 main effect hypotheses and 2 mediating effect hypotheses were tested through the reliability test, validity test, measurement model and structural model analysis. The empirical results show that the integrated TAM-IS model can basically explain the user satisfaction of Gannan navel orange quality traceability system. The specific conclusions are as follows:

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(1) Of the 10 main effect hypotheses, 6 are true and 4 are false. Among them, perceived ease of use is significantly affected by system quality, but not by information quality and service quality, which is completely consistent with the results of Zhu Duogang [16] and others in the research of mobile government user satisfaction that system quality, information quality and service quality only have significant impact on perceived ease of use. Moreover, the empirical studies of Wang Fan [17], Zhang Pei [18],Wei Sha [14] and others have verified that system quality has a significant impact on perceived ease of use, which also shows the importance of system quality in information system.

System quality and information quality have no significant impact on perceived usefulness, which is inconsistent with the hypotheses and the research results of Wei Sha [14],Li Haojun [17] and others.

Satisfaction is positively and significantly affected by perceived usefulness, not significantly affected by perceived ease of use, which is consistent with the results of Zong Wei [21] in his empirical research on ERP user satisfaction that perceived usefulness has a significant impact on satisfaction, but the impact of perceived ease of use on satisfaction is not supported, and that perceived ease of use has a positive and significant impact on perceived usefulness.

Government support has a positive and significant impact on perceived usefulness and satisfaction, indicating that the greater the government support, the higher the perceived usefulness of Gannan navel orange quality traceability system for users. Similarly, the greater the government support, the higher the user satisfaction with Gannan navel orange quality traceability system.

(2) Of the 2 mediating effect hypotheses, 1 is true and 1 is false. Among them, system quality has a positive and significant impact on satisfaction through the mediator variables of perceived ease of use and perceived usefulness, which shows that the better the system quality, the higher the user perceived ease of use and perceived usefulness, and the higher the user satisfaction with Gannan navel orange quality traceability system. However, information quality, through the mediator variables of perceived ease of use and perceived usefulness, has no significant impact on satisfaction, and the mediating effect hypothesis is false.

Based on the above conclusions, the following policy recommendations are put forward for governments at all levels to further promote the quality traceability system of agricultural products:

(1) Pay attention to the usefulness of the publicity quality traceability system. The usefulness of the quality traceability system has a significant impact on the user's intention to

use. Fruit bureaus at all levels and agricultural technology promotion personnel should expand the publicity and promotion of the quality traceability system of Gannan navel orange, widely publicize the quality and safety guarantee function of the traceability system, and enhance the farmers' willingness to use the traceability system.

(2) Improve user satisfaction of quality traceability system.In the development and maintenance of the system, it is necessary to fully understand the expectations and needs of the users, and develop the functions of the system accordingly to meet the expectations of the users to the greatest extent, and do a good job in the maintenance of the system to improve the user satisfaction with the quality traceability system.

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REFERENCES

[1]Min Qingfei, Liu Zhenhua, Ji Shaobo (2008) Meta-analysis of information technology adoption research: 2000-2006. Journal of Information Systems 2 (02): 22-32

[2] Zhang Nan, Guo Xunhua, Chen Guoqing (2009) A review of information technology adoption research from the perspective of behavior modeling. Scientific Management Research 27 (04): 13-19

[3]Liu Luchuan, Sun Kai (2011) Theoretical model of mobile search user continuous use based on extended ECM-ISC. Library and Information Service 55(20):134-137+148

[4]Fei Xinyi, Shi Yun, Yuan Qinjian. (2018) Application and prospect of D and M information system success model. Modern Information 38(11):161-171+177

[5] Wang Zuzhu, Wu Lei (2013) Research on the influencing factors of user satisfaction of participating in professional virtual communities. Journal of Wuhan University of Technology. Information and Management Engineering Edition 35(5):784-788

[6]Yang Yiweng, Sun Guohui, Wang Yi (2016) Are consumers willing to adopt recommendations? ——Based on Information System Success-Technology Acceptance Model. Journal of Central University of Finance and Economics (7):109-117

[7]Wang Wentao, Li Jing, Zhang Shuai, et al. (2018) Research on user willingness to use virtual health community from the perspective of information system success. Modern Information 38(2):29-35

[8]Zhang Yaming, Zhang Yidan, Liu Haiou (2018) Study on the adoption behavior of context-aware service of mobile business users. Information Science 36(03):87-92+111

[9]Yang Honglin, Cao Xiaoshu, Li Tao, Tian Ruijuan (2019) Analysis of urban residents' willingness to use shared bicycles and influencing factors—Taking Xi'an as an example. Arid Land Resources and Environment 33(06):78-83

[10]Chen Juan, Li Jinxu (2019) A study on the preference of university students' paid knowledge products——Taking ten universities in Guangzhou University Town as examples. Modern Communication (Journal of Communication University of China) 41(12):119-126

[11]Zhang Qingjie, Gong Hanshi (2018) Research on user intention to use face recognition payment. Finance and Economics Theory and Practice 39(05):109-115

[12] Hu Fangxiao, Zhang Meili, Li Mengna (2014) Empirical research on the influencing factors of satisfaction of the new rural social pension insurance system. Journal of Public Administration (4): 95-104

[13]Zhang Yuwei, Xing Wen, Xu Qian, Guan Jixing (2019) Study on enterprise cloud ERP system conversion willingness from a multi-theoretical perspective. Science Research Management 40(11):175-184

[14]Wei Sha (2016) Research on the influencing factors of nurses' acceptance of mobile nursing information system based on TAM. Chongqing Medical University

[15]Xu Zhuoyu, Lan Guoshuai, Xu Meidan, Ma Shigui (2017) Research on the influencing factors of MOOCs platform users' willingness to use——Based on the perspective of TAM-IS success model. Digital Education 3(04):26-32

[16]Zhu Duogang, Guo Junhua (2016) Research on mobile government user satisfaction based on TAM model. Information Science 34(07):141-146

[17]Wang Fan (2017) Research on the influencing factors of mobile library users' willingness to continue use. Library Work and Research (07):50-56.

[18]Zhang Bei, Lin Jiabao (2014) Research on the influencing factors of traceable fruit consumers' purchasing behavior——Based on the comprehensive perspective of psychological responses. Consumer Economy 30(01):51-57

[19]Li Haojun, Ran Jinting (2018) Research on the construction of user behavior willingness model of

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University mobile library 2018(4):73-78

[20]Xia Baoguo, Chang Yaping (2014) Research on the communication mechanism of government WeChat——Based on the perspective of TAM. Journal of National School of Administration (03):102-106

[21]Zong Wei, Wu Feng, Ma Chao (2013) Research on cognitive differences of successful ERP implementation based on two-factor theory. Industrial Engineering and Management18(05):80-87+92.

[22]Wei Yanli, Cao Xiaoqiang, Cai Yanling, Zhai Yunkai, Liu Ruifang (2018) Study on influencing factors of willingness to use remote monitoring services for chronic diseases based on technology acceptance model. Chinese General Practice 21(08):958-964

[23]Cui Hongcheng, Chen Qingguo (2020) Research on the continued use intention of mobile fitness app users. Journal of Capital Institute of Physical Education 32(01):75-81+96