International Journal of Management Science Research, Vol.8, Issue 5, (May)
ISSN 2536-605X **2025**
DOI: 10.53469/ijomsr.2025.08(05).09

A Study on the Influence of Strength of Social Ties and Product Engagement Level on Purchase Intention: The Mediating Role of Perceived Risk

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Abstract: ***This study is based on the S-O-R model as well as the theory of planned behaviour to construct a complex transmission mechanism of consumers' willingness to choose to buy agricultural products online with the strength of social relationship HO product involvement as the antecedent variable and perceived risk as the mediator variable. This study used convenience sampling method to distribute questionnaires to consumers, and a total of 270 questionnaires were returned, of which 190 were valid questionnaires. The results show that: social relationship strength and product involvement positively affect perceived risk; social relationship strength and product involvement and perceived risk positively affect purchase intention; and perceived risk plays a mediating role in the relationship between social relationship strength and product involvement and purchase intention.***

Keywords: Strength of social ties; Product Engagement Level; Perceived risk; Emotional experience; Purchase Intention.

1. INTRODUCTION

The rapid development of online shopping has brought great changes to the life style of consumers (J. L. Guo, H. C. Hao, M. D. Wang, & Z. Y. Liu, 2022). specially after the COVID-19 pandemic, in order to avoid the risk of infection, more people choose to buy agricultural products online (H. Y. Liu & Tong, 2024), promote more and more consumers to gradually adapt to the lifestyle of purchasing agricultural products online (J. L. Guo et al., 2022). According to statistics, the value of agricultural products sold through e-commerce platforms in China in 2023 will be about CNY 587.03 billion. The 2025 China Agricultural Products E-commerce Development Report points out that the retail sales of China 's agricultural products e-commerce network will exceed CNY 630 billion in 2024, reaching CNY 679.78 billion, an increase of 15.8 % year-on-year. At the same time, in order to effectively alleviate the unsalable agricultural products caused by the epidemic in some regions, China e-commerce platform helps to sell agricultural products through agricultural marketing activities (Wu, Wang, Yan, & Zheng, 2022). For example, Chinese commerce giant Alibaba's Rural Support Program helped Chinese farmers connect with 41 million fans, selling 15 million kilograms of fresh produce in just three days (H. Y. Liu & Tong, 2024). It can be seen that e-commerce of agricultural products plays an important role in promoting farmers' quality improvement and income increase (Fecke, Danne, & Musshoff, 2018). However, compared with other daily necessities, the penetration rate of online shopping of agricultural products in China is still low (Wu et al., 2022), For example, daily necessities and apparel products accounted for 45.2%, and accounted for only 8.6% of the online retail sales of physical commodities in the first half of 2023[], and the online purchase of daily necessities has become a daily routine of people's lives (J. L. Guo et al., 2022), but people remain skeptical about buying agricultural products online (Fu, Ma, He, Chen, & Liu, 2023). As a key link of the chain, consumers willingness to purchase is very important to the development of e-commerce agricultural (Fu et al., 2023). Therefore, we need to understand the internal mechanisms that influence the willingness of consumers to buy.

As trendsetters and growing purchasing power levels, college students will have a significant impact on the future social market environment (Sahelices-Pinto, Lanero-Carrizo, & Vázquez-Burguete, 2021). In addition, college age is an important period for developing lifelong brand loyalty and consumption style (Noble, Haytko, & Phillips, 2009), and an important period for e-commerce penetration of agricultural products. However, the consumption attitude and motivation of college students to e-commerce agricultural products are still unclear. Therefore, we think it is necessary to understand the attitude of college students to online purchase of agricultural products and its impact mechanism.

There have been studies on electronic word-of-mouth (Nofal, Bayram, Emeagwali, & Al-Mu'ani, 2022), brand

word-of-mouth (Baker, Donthu, & Kumar, 2016), customer engagement (L. Ma, Zhang, Ding, & Wang, 2021) and the strength of social relationships (Yan, Wu, Zhou, & Zhang, 2018) and so on. In real life, people tend to accept information from friends, family and their close relationship, and will stimulate a series of behavior (L. B. Sun, Wang, & Guan, 2023). In addition, with the development of electronic communication technology, individuals can communicate with others more frequently and more conveniently (Wang, Wang, & Wang, 2018), establish connections through the Internet, become important information sources for users, and have an important influence on user decision-making (J. C. Wang & C. H. Chang, 2013). But there are There are inconsistent conclusions about the influence between Strength of social ties and user behavior. In word-of-mouth marketing, more studies have demonstrated that word-of-mouth information from strong relationships is more persuasive than word-of-mouth information from weak relationship (Yan et al., 2018). However, (Lee & Kronrod, 2020) found that weak relationships (such as distant friends and acquaintances) were more influential than strong ones when using consensus language. (Song, Yi, & Huang, 2017)) argued that, in the initial stage of shopping, the recommendation of weak relationship is expected to be more persuasive than that of strong relationship; In the later stages of shopping, consumers are more likely to be recommended by strong relationships. Therefore, it is important to understand that the strength of social relations affects consumers' willingness and behavior to buy agricultural products online.

In addition to soliciting opinions from relatives and friends before shopping, consumers personal network participation can also influence their decision-making mode (Liao, Hu, Chung, & Huang, 2021). The marketing literature considers user engagement as a core determinant of consumer behavior, as it includes behavioral engagement, willingness to pay, and actual payment for goods and services produced and transferred (Sharma & Klein, 2020; H. Wu, T. Xiao, & X. Y. Wu, 2017). (Liao et al., 2021) believes that when a product category is associated with a system of self-worth or self-concept, online participation occurs and motivates them to actively search for product-related online information and then evaluate the product information and judge purchasing decisions. Many researchers believe that user product engagement should be classified as low, medium, high or simply low and high (Geng & Chen, 2021; Li, Hu, Chen, & Lei, 2021). However, longitudinal studies from low to high alone do not adequately reflect the degree of product participation, as vertical and horizontal perspectives are not considered. When a user participates in an enterprise's goods or services, there is not only the depth of product participation, but also the extent (scope, quantity and stage) of its participation (H. Wu et al., 2017). (Bruwer & Cohen, 2019) distinguishes product engagement into persistent involvement and situational involvement. Situational involvement usually has a buying decision time frame, and persistent involvement is a long focus. But in the process of online shopping, there is less restriction on the decision-making tim (J. Guo, H. Hao, M. Wang, & Z. Liu, 2022). Therefore, we believe that the level of user engagement in the product involves both breadth and depth.

Previous studies on the influence of information sources on consumers online purchase intention either discussed the influence of external information sources on consumers online purchase willingness, such as the information sources of the third institution (Zhu, Chang, & Luo, 2016); or discuss the influence of peripheral information sources on consumers ' purchase intention online, such as the strength of social relationship (Yan et al., 2018), and few studies have discussed both sources of information together. Because consumers not only receive the influence of external information but also the influence of internal information sources in the process of purchasing decision (Liao et al., 2021). Therefore, we discuss its influence on consumers' online purchase intention of agricultural products from the perspective of internal and external dimensions.

according to the stimulation-organism-response (s-o-r) model, consumers, upon receipt of information about a product, first process the information prior to purchase (Yan et al., 2018). (J. C. Wang & C. H. Chang, 2013) believes that when consumers receive product information, they will process and judge the information and evaluate the risks related to the product, and then decide whether to purchase or not. Perceived risk is described as uncertainty combined with expected losses associated with purchases (Chen & Huang, 2017). In the online shopping environment, consumers face higher uncertainty in achieving their shopping goals. They believe that online shopping is more risky than physical shopping (E. C. Chang & Y. F. Tseng, 2013). Previous studies focused more on the impact of perceived risk on product engagement (Chang & Wu, 2012), but less on perceived risk. Therefore, we propose that perceived risk affects consumers' purchase intention agricultural products online through the strength of social relationships and the degree of product participation.

Based on the above reasons, the main purposes of this study are as follows: First, to explore the intermediary mechanism of perceived risk between the strength of social relations and the purchase intention agricultural products online; Secondly, the paper studies the mechanism of perceived risk between the degree of product

participation and the willingness to purchase on-line agricultural products.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 S-O-R Model

The S-O-R model, developed from environmental psychology, shows that various aspects of the environment act as external stimuli that affect the internal cognition and emotion of individuals, and thus prompt them to make behavioral response (Cao & Sun, 2018). The model is also widely used in the retail industry to predict consumer sentiment and behavior (Loureiro, 2015). Among them, the stimulus (S) may appear in different forms (J. C. Wang & C. H. Chang, 2013), containing information, design, and other features of the online store (Loureiro, 2015). Organism (O) refers to an individual's cognitive system, including cognitive network and schema. Reaction (R) represents psychological reactions such as attitude and behavioral response (J. C. Wang & C. H. Chang, 2013). Based on the above concepts, we propose a theoretical framework. Social relationships and degree of product engagement (stimulus) affect perceived risk (organism) of consumers, which in turn influences purchase intention (Reaction).

2.2 Strength of Social Relations and Purchase Intention

Social relationships are defined as a set of social interactions between two or more individua (J. C. Wang & C. H. Chang, 2013). Previous studies have shown that users receive a large amount of information on social media every day, but their acceptance of information is influenced by the information source (L. B. Sun et al., 2023). In consumer cognitive behavior, strong relationship sources are considered more reliable than weak relationship source (J. C. Wang & C. H. Chang, 2013). Relationship intensity refers to the intensity level of the social relationship between consumers or the overlapping degree of two-person friendship (Yan et al., 2018). Strong relationships involve frequent interactions, usually close friends or immediate family members; weak relationships tend to have less frequent interactions, often acquaintances or strange (Baker et al., 2016).

Previous studies have shown that Strength of social ties plays an important role in the user's decision-making process and purchase frequency (L. B. Sun et al., 2023). Information from strong relationships is considered to be more useful, while information from weak relationships is considered less valuable (Yan et al., 2018). (Zhu et al., 2016) Based on the two-process model, it is shown that the relationship strength is the persuasive information from the peripheral clues for users, and it is an important clue influencing the user's decision-making. the underlying principle of planned behavior theory is that individual behavior depends on intent and that subjective norms play a crucial role in influencing purchasing decision (Patel et al., 2023). In consumer cognitive behavior, strong relationship sources are considered more reliable than weak relationship source (J. C. Wang & C. H. Chang, 2013). Therefore, based on the theory of planned behavior, this study proposes the following hypotheses:

H1: The strength of social relationship has significant positive influence on purchase intention

2.3 The Mediating Effect of Perceived Risk on the Strength of Social Relationship and Purchase Intention

Perceived risk is the view of uncertainty and adverse consequences of consumer participation in an activity (E. C. Chang & Y. F. Tseng, 2013). Perceived risk is a combination of negative consequences and uncertainty (Chen & Chang, 2012). In an online buying environment, there is no visual or tangible sign related to product quality, nor face-to-face interaction with salespeople (Liao et al., 2021), the asymmetric information between the buyer and the seller makes it difficult for consumers to evaluate product information (Chen & Chang, 2012; Liao et al., 2021). They believe that online shopping is more risky than physical shopping because of the higher uncertainty in achieving their expected shopping goal (E. C. Chang & Y. F. Tseng, 2013).

Thus, some studies have considered the potential risks and opportunities of consumers and operators' purchase intention online and can translate risks into opportunities by effectively using appropriate alternative (Liao et al., 2021). Such as improving consumers' perception of value (Chen & Chang, 2012) and the image of e-store (E. C. Chang & Y. F. Tseng, 2013) and others. When consumers are in an information-disadvantaged position, they will obtain more information from a third party to reduce the disadvantages. For example, most consumers will collect information extensively and seek the opinions of relatives and friends before shopping online (Liao et al., 2021). And consumers are more likely to trust information from strong relationship sources and believe that their information is more reliable (J. C. Wang & C. H. Chang, 2013). (Zhang & Wang, 2019) pointed out that

information obtained from sources with strong relationships is less risky. Therefore, this study is based on the S-O-R model (Cognitive schema in which stimulus (S) affects organism (O)), the following hypothesis is proposed:

H2: Strength of social ties significantly negatively affects perceived risk

If consumers consider a product to be highly risky, they are reluctant to trust the product and negatively affect their purchasing decisions (Chen & Chang, 2012). In addition, due to the limitation of online shopping, consumers perceive higher shopping risk and bear more losses (E. C. Chang & Y. F. Tseng, 2013). This leads consumers to pay more attention to reducing the purchase risk rather than the product itself in the process of purchasing decision (Chen & Huang, 2017). (Liao et al., 2021) points out that in the context of online purchase, consumer perceived risk has a significant negative impact on online purchase intention. It is suggested that consumers may change their minds because of perceived purchase risk, and online stores are associated with higher risk, making them likely to decide to give up buying because of purchase risk (E. -C. Chang & Y. -F. Tseng, 2013). The above studies suggest that perceived risk has a negative effect on online purchase willingness. In addition, based on the S-O-R model, we believe that the strength of social relationships as a stimulus will influence the perception of risk perceived by organisms and thus prompt them to make decisions about purchasing agricultural products online. Therefore, the following hypotheses are presented in this study:

H3: Perceived risk significantly negatively affects purchase intention

H4: Perceived risk will mediate the strength of social relationships and the purchase intention

2.4 Product Engagement Level and Purchase Intention

The degree of product participation includes user-provided resources, behavioral participation and physical, mental and emotional participation (H. Wu et al., 2017). It is composed of breadth and depth, in which breadth reflects the scope, quantity and stage of user participation; Depth indicates the degree of user participation, which can be divided into deep participation and surface participation (H. Wu et al., 2017). (Li et al., 2021) believes that participation is the relevance of the perceived interests of an individual's internal needs, where high participation means that the product or service is highly relevant to the individual. (Q. H. Liu, Zhang, Huang, Zhang, & Zhao, 2020) showed that if customers are more engaged in a product, they will search for more detailed information about the product or service and will make more effort in selecting the product. and the extent of online involvement depends on consumers' personal interpretations and preferences for internet information sources (Liao et al., 2021), is a cognitive factor that influences consumer decision-making behavior (Li et al., 2021).

(Liao et al., 2021) indicates that consumers' personal participation in online products affects their purchase intention online and their satisfaction. Whereas (Li et al., 2021) the study found that when consumers were highly engaged, they spent more time evaluating goods and reduced consumer impulse buying behavior. Because consumers will evaluate whether they will have the wrong purchase behavior according to the obtained information (Q. H. Liu et al., 2020). (Klein & Sharma, 2022) also shows that product participation is the determinant of consumer behavior, from product development to information collection, purchase, consumption and consumption disposal. Therefore, the following hypotheses are presented in this study:

H5: Product participation significantly positively affects purchase intention

2.5 The Mediating Effect of Perceived Risk on Product Participation and Purchase Intention

Previous studies have shown a strong relationship between product engagement and perceived risk, and the conceptual similarity between the two is attributed to the role of participation and risk in stimulating consumer response (Hong, 2015). (Liao et al., 2021) believes that electronic word-of-mouth will affect the perceived risk of consumers to a certain extent under different levels of network participation. (Hong, 2015) suggests that sustained engagement may affect perceptions of risk in purchasing products. Highly engaged consumers will search for more information about the product and evaluate alternatives (Q. H. Liu et al., 2020). When consumers gain knowledge of a wide range of products, the less likely they perceive risk (Hong, 2015). Therefore, the following hypotheses are presented in this study:

H6: Significant positive impact of Product Engagement Level on perceived risk

H7: Perceived risk will mediate the degree of product participation and purchase intention

3. RESEARCH METHODS

3.1 Questionnaire Design and Measurement of Variables

All scales in this study were measured on a Likert 5-point scale. All measurements were initially in English, first translated into Chinese by one scholar and back-translated into English by another scholar. The third scholar compared the two copies of English. All formal scales were self-reported by the interviewee.

Strength of social relationships. This study adopted (L. Sun, Wang, & Guan, 2021) The scale primarily measures the sharing of information between an individual and friends. For example, "I communicate with friends almost every day". The Cronbach's alpha for this study was 0.84.

Product Engagement Level. In this study. In this study, a 7-item scale developed by (H. Wu, T. Xiao, & X. Wu, 2017) was used. The scale mainly measures the degree of product participation of individuals in purchasing agricultural products. For example, “In the above scenario of buying agricultural products, I feel like Ive been involved in a lot of activities.” The Cronbach's alpha for this study was 0.875.

Perceived risk uses a scale prepared by (Xu, Wang, Li, & Liu, 2023). The scale consists of 5 items, mainly measuring the quality and taste of agricultural products perceived by individuals. For example, "I'm worried that I'll run into counterfeits when buying agricultural products". The Cronbach's alpha for this study was 0.853.
Purchase intention utilized a 4-item scale developed by (C. -C. Ma & Chang, 2022) (C. -C. Ma & Chang, 2022), Measuring Individuals' Willingness to Purchase Produce Online. For example, “Im willing to buy produce sold on online shopping sites”. The Cronbach's alpha for this study was 0.859.

Control variable. We controlled gender, age, grade, monthly spending, and agricultural shopping experiences to minimize possible mistakes.

3.2 Data Collection

In this study, questionnaires were sent out to universities in Guilin, Guangxi, China. We invited students from various universities in Guilin to fill in questionnaires. Before inviting the personnel to fill in the questionnaire, the investigator will ask whether the student is a university student. If the answer is not a university student, the questionnaire will not be distributed, so as to ensure that the respondents are the students of Guilin university. Data collection took place from 10th to 17th May 2024.We issued 270 questionnaires for the first time, but refused to fill in 54 A total of 216 questionnaires were returned. After deleting the missing invalid questionnaires, 190 valid questionnaires were obtained, the recovery rate was 70.37%. The basic information of respondents is as follows: 157 (82.63%) are female. Age of respondents.

The age range was generally between 20 and 29 years, with 128 people (67.37%). Among the respondents, 55 students (28.95%) were in the third year of undergraduate education, followed by 47 (24.74%) in the second year and 45 (23.68%) in the first year.114 people (60%) spend between 1001-1500 per month, the next monthly expenditure is below 1000 yuan, 36 persons (18.94%). Occasional (every other Once or twice a month) The highest number of people buying agricultural products is 92 (48.42%) and very few (once or twice a year) The number of people buying agricultural products was 61 (32.11%).

4. DATA ANALYSIS

4.1 Common Methods ANOVA Test

To determine if the common method variance is valid, we used the Harman one-way test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), found the largest factor explained variation of 25.401% (<40%) and there was no serious common method bias in this study.

4.2 Validated Factor Analysis

We validated the measurement model by performing CFA on the four structures. The results showed that the

four-factor model fit was better than the alternative model (CMIN/DF=2.257, RMSEA=0.076, IFI=0.904, CFI=0.903), consistent with RMESA<0.08 (MacCallum, Browne, & Sugawara, 1996), AGFI>0.8 (MacCallum & Hong, 1997), IFI>0.8 (Marsh & Hau, 1996), CFI>0.8 (Bentler & Bonett, 1980). The results are shown in Table 1.

Table 1: Test factor analysis

	CMIN/DF	GFI	AGFI	IFI	CFI	RMSEA
Four-factor model (Strength of social ties, Product Engagement Level, Perceived risk, purchase intention)	2.071***	0.821	0.776	0.892	0.890	0.075
Three-factor model (Strength of social ties+ Product Engagement Level, Perceived risk, purchase intention)	3.554***	0.674	0.6	0.738	0.735	0.116
Two-factor model (Strength of social ties+ Product Engagement Level+ Perceived risk, purchase intention)	5.202***	0.572	0.479	0.564	0.559	0.149
Single-factor model	5.888***	0.548	0.453	0.491	0.485	0.161

In this study, composite reliability (CR) and extracted mean variance (AVE) were used to test aggregation validity. The AVE of all variables meets the recommended threshold of greater than 0.5 (Hair, Black, Babin, & Anderson, 2014) and the composite reliability (CR) is greater than (Hair et al., 2014) Recommended 0.7. The results are shown in Table 2.

Table 2: Factor Loading and Convergent Validity

	Order	Factor Loading	AVE	CR
Strength of social ties	S1	0.735	0.526	0.869
	S2	0.762		
	S3	0.727		
	S4	0.714		
	S5	0.749		
	S6	0.66		
Product Engagement Level	L1	0.835	0.507	0.873
	L2	0.806		
	L3	0.828		
	L4	0.806		
	L5	0.592		
	L6	0.477		
	L7	0.535		
Perceived risk	P1	0.74	0.594	0.879
	P2	0.815		
	P3	0.811		
	P4	0.755		
	P5	0.728		
purchase intention	I1	0.75	0.6	0.857
	I2	0.745		
	I3	0.824		
	I4	0.776		

4.3 Correlation Analysis and Differential Validity Test

We performed the Pearson analysis using SPSS 25 software and the results are shown in Table 3. There were significant positive correlations among social relationship intensity, product participation, perceived risk and purchase intention. The diagonal is the square root of AVE, and the square root of AVE is larger than the correlation coefficient of the same column, indicating that the variable has discriminant validity.

Table 3: Summary of correlation analysis

	M	SD	gender	age	current grade	Monthly expenses	Agricultural purchasing experience	Strength of social ties	Product Engagement Level	Perceived risk	purchase intention
gender	1.83	00.380	1	-0.109							
age	1.78	00.525	-0.109	1							
current grade	2.57	01.231	-0.082	0.591**	1						
Monthly expenses	2.12	00.861	-.146*	0.187**	0.184*	1					
Agricultural purchasing experience	1.92	00.809	0.076	0.196**	0.088	0.150*	1				

Strength of social ties	3.661	0.691	0.046	-0.123	0.011	0.055	-0.091	0.725		
Product Engagement Level	3.215	0.720	0.029	0.079	0.074	-0.034	0.141	0.342**	0.712	
Perceived risk	3.901	0.763	0.200**	-.157*	-.162*	-.143*	0.051	0.200**	0.243**	0.771
purchase intention	3.570	0.747	0.085	-0.063	0.016	-0.13	0.009	0.345**	0.522**	0.348**	0.775

Notes: *p < 0.05, **p < 0.01, n=190.

4.4 Hypothesis Testing

4.4.1 Path analysis

The assumptions presented in this study were analyzed using AMOS software and the results are shown in Table 4.H1 predicts that the strength of social relationships will positively affect the purchase intention. The results showed that the strength of social relationship positively affected purchase intention (Coefficient=0.229, p<0.05). Therefore, H1 is supported.

H2 predicts that the strength of social relationships will negatively affect perceived risk. Contrary to Hypothesis 2, the results indicate that Strength of social ties positively influences perceived risk (Coefficient = 0.236, p < 0.05). Therefore, H2 is not supported.

H3 predicts perceived risk will negatively impact purchase intention. Contrary to Hypothesis 3, the results show that perceived risk positively affects purchase intention (Coefficient = 0.296, p < 0.001). Therefore, H3 is not supported.

H5 predicts that product engagement will positively impact purchase intention. The results showed that the degree of product participation positively affected purchase intention (Coefficient=0.976, p<0.001). Therefore, H5 is supported.

H6 predicts that Product Engagement Level will positively impact perceived risk. The results showed that Product Engagement Level did not positively impact perceived risk (Coefficient = 0.291, p > 0.05). Therefore, H6 is not supported.

The indirect effect indicated that there was an indirect effect between social relationship intensity and product participation (Coefficient=0.385, p<0.05). Therefore, we will use SPSS to further examine the mediating effect of perceived risk between the strength of the social relationship or the degree of engagement in the product and the purchase intention.

Table 4: Multiple mediation model path test

Hypoth esis		Coefficient	Boot LLCI~Boot ULCI	BC LLCI'~BC ULCI'
	Direct effect			
1	Strength of social ties→ purchase intention	0.229*	0.016~0.575	0.019~0.490
2	Strength of social ties→ Perceived risk	0.236*	-0.019~0.575	-0.019~0.575
3	Product Engagement Level→ purchase intention	0.976***	0.568~0.863	0.555~1.576
4	Product Engagement Level→ Perceived risk	0.291	-0.174~0.863	-0.163~0.885
5	Perceived risk→ purchase intention	0.296***	0.134~0.502	0.131~0.498
	Indirect effect			
6	Strength of social ties/Product Engagement Level→ Perceived risk→ purchase intention	0.385*	0.143~0.693	0.136~0.669

Notes: *p<0.05, ***p < 0.001.

4.4.2 Linear Regression Analysis

We performed a linear regression analysis using SPSS 25 software and the results are shown in Table 5.H2 predicts

that the strength of social relationships will negatively affect perceived risk. Consistent with the results in AMOS, model2 showed that Strength of social ties positively influenced perceived risk (β=0.204, p<0.05). Therefore, H2 is not supported. Although inconsistent with our hypothesis, some studies have demonstrated that Strength of social ties positively affects perceived risk (J. -C. Wang & C. -H. Chang, 2013).

H3 predicts perceived risk will negatively impact purchase intention. Consistent with the results in AMOS, Model 7 indicated that perceived risk positively affected purchase intention (β=0.343, p<0.001). Therefore, H3 is not supported. Every consumption is a risk-taking behavior for consumers, and consumers with excessive risk tendency will pursue technologies to increase risk and improve their returns (Cho & Lee, 2006). From this point of view, we can assume that the higher the perceived risk, the higher the purchase intention for this excessive risk tendency (Brockhaus Sr, 1980).

H4 predicts that perceived risk will mediate the impact of Strength of social ties on purchase intention. Model 8 showed that the influence of social relationship intensity on purchase intention was weakened after the introduction of perceived risk, and the β coefficient decreased from 0.353 (p<0.001) to 0.296 (p<0.001) in Model 5. Perceived risk produced a significant mediating effect between social relationship intensity and purchase intention (β=0.280, p<0.001). Therefore, H4 is supported.

H6 predicts that the level of product engagement will impact perceived risk. Model3 indicated that Product Engagement Level positively influenced perceived risk (β=0.244, p<0.01). This is different from the results of AMOS in that the degree of product participation has a positive and significant effect on perceived risk, but in this research framework, this path is not significant, indicating that the influence of this path is "deprived" by other paths. Therefore, H6 is supported.

H7 predicted the impact of perceived risk on the purchase intention as a result of intermediate Product Engagement Level. Model 8 showed that the influence of product participation on purchase intention was weakened after the introduction of perceived risk, and the β coefficient decreased from 0.527 (p<0.001) in Model 6 to 0.473 (p<0.001). Perceived risk produced a significant mediating effect between Strength of social ties and purchase intention (β=0.222, p<0.001). Therefore, H7 is supported.

Table 5: Regression analysis

Variable	Perceived risk				purchase intention				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Control variable									
gender	0.163	0.152	0.159 *	0.061	0.042	0.052	0.005	-0.001	0.017
age	-0.084	-0.046	-0.092	-0.097	-0.031	-0.115	-0.068	-0.018	-0.095
current grade	-0.087	-0.111	-0.101	0.098	0.057	0.069	0.128	0.088	0.092
Monthly expenses	-0.099	-0.117	-0.082	-0.127	-0.158	-0.09	-0.093	-0.125	-0.072
Agricultural purchasing experience	0.077	0.094	0.044	0.034	0.063	-0.039	0.007	0.037	-0.049
Primary variable									
Strength of social ties		0.204 *			0.353 ***			0.296 ***	
Product Engagement Level			0.244 **			0.527 ***			0.473 ***
Perceived risk							0.343 ***	0.280 ***	0.222 ***
R^2	0.078	0.118	0.136	0.03	0.15	0.3	0.138	0.219	0.342
Adj R^2	0.053	0.089	0.107	0.003	0.122	0.277	0.11	0.189	0.317
F-value	3.109 *	4.076 **	7.783 ***	1.125	5.366 ***	13.046***	4.889 ***	7.281 ***	13.515***
D-W	1.783	1.791	1.788	1.968	1.844	1.881	1.902	1.792	1.827
Max VIF	1.609	1.61	1.645	1.609	1.645	1.61	1.617	1.648	1.62

Notes: *p<0.05, **p<0.01, ***P<0.001.

5. CONCLUSION

5.1 Theoretical Contribution

Based on the S-O-R model and the theory of planning behavior, this study explored the direct influence of social relationship intensity and product participation on the purchase intention of agricultural products, and the partial mediation of perceived risk between social relationship intensity and purchase intention and between product participation and purchase intention.

First, the intensity of social relations can significantly and positively affect the students' willingness to purchase agricultural products. The results showed that the social relationship intensity positively affected the students' purchase intention of agricultural products, which is consistent with the previous research results (L. B. Sun et al., 2023). The stronger the social relationship is, the greater the willingness of students to buy agricultural products through frequent sharing of supportive information to enhance mutual trust and friendship (Ebrahimi, Khajeheian, Soleimani, Gholampour, & Fekete-Farkas, 2023). To this end, sellers of agricultural products should organize corresponding marketing campaigns to encourage information sharing and exchange among consumers, and transform potential customers into real consumers by increasing positive and supportive information among consumers.

Secondly, the degree of product participation can significantly and positively affect students' willingness to purchase agricultural products, which is consistent with previous studies (Klein & Sharma, 2022). In the purchasing process, the higher the degree of product participation, the more students participate in and interact with the brand, which will further enhance the purchase intention (Hollebeek, Glynn, & Brodie, 2014). For example, the perceptual interaction of a short video promotes the interaction between the consumer and the product and enhances the interest and willingness of the consumer to purchase the product (Yu et al., 2024).

Finally, the paper further verifies that perceived risk plays an important role in the mediation of Strength of social ties, purchase intention, product participation and purchase intention. Although it is inconsistent with the hypothesis of this study that the strength of social relationship positively affects perceived risk and perceived risk positively affects purchase intention, perceived risk still plays an important role in the mediation between Strength of social ties and purchase intention. (Brockhaus Sr, 1980) confirms that consumers with high risk-taking tendency perceive higher perceived risk in social network and are willing to have higher purchase intention for higher return. In addition, the interactivity and dynamics of the live broadcast and the demonstration of authenticity will increase consumers participation in the product, reduce perceived risk of the product and enhance the shopping experience, thereby increasing their purchase intention (Wongkitrungrueng & Assarut, 2020). For example, marketing managers regularly focus on social media users who have close ties to consumers, and recommend and promote new products, discounts, and promotions to their friends, which will attract and enhance the browsing experience and purchase intention (Chahal & Rani, 2017).

5.2 Practical Contributions

In view of the mediating role of perceived risk in the impact of social relationship intensity and product participation on the purchase intention of agricultural products, this study will put forward some suggestions on online sales of agricultural products from the following three aspects, hoping to benefit the development of online sales of agricultural products.

First of all, sellers of agricultural products should take a series of practical actions to enhance the strength of consumers' social relations, so as to reduce the perceived risk of consumers and improve their purchase intention. Sellers can use the social media platform to establish an online community to encourage consumers to join in and share their purchasing experience, cooking experience, etc. Through interaction and sharing, consumers perceived risk to the quality and safety of agricultural products can be reduced, and consumers trust in agricultural products can be enhanced, so as to improve the purchase willingness. At the same time, actively guide the interaction and communication within the community, set up incentive mechanism, and encourage consumers to share information. For example, for sharing a purchase experience on social media or recommending farmers. The consumer of the product can give a certain discount or reward. By encouraging consumers to share positive information, promote a positive atmosphere within the community that reduces the perceived risk to consumers of buying agricultural products and makes them feel that they are a trustworthy community and therefore more willing to buy. In addition, sellers of agricultural products should pay attention to word-of-mouth marketing, encourage consumers to recommend products to their relatives and friends by improving product quality and service level, spread positive information through people trusted by consumers, reduce their perceived risks, and promote the transformation of more potential consumers.

Second, sellers of agricultural products should enhance the participation of consumers in the process of purchasing products and enhance their purchase willingness. The sellers of agricultural products need to pay attention to promoting the participation of consumers in products, such as providing personalized product recommendation and allowing consumers to participate in product design, so as to enhance the interest and identity of consumers in products. The sellers of agricultural products can use a variety of means to increase the interactivity of their products. For example, short videos or live broadcasts of the planting, growth, picking and other processes of agricultural products are released through the social media platform, so that consumers can feel the growth environment and quality of the products in real time, and the participation and trust of the consumers in the products are improved. These activities can not only enhance the participation of consumers in the products, but also enhance the trust and loyalty of consumers to the products, thus enhancing the purchase intention.

Finally, sellers need to identify and distinguish consumer groups with different risk-taking tendencies, and formulate special sales strategies for consumers with higher risk-taking tendencies. For high risk-taking consumers, the seller should clearly and clearly communicate the potential risks and possible high returns of the product. By providing detailed production process, sales model, user evaluation and other information, help them better understand the risk-reward relationship of the product, thus stimulating their purchase intention. At the same time, for consumers with high risk- taking tendency, enterprises can design some customized preferential and incentive measures, such as providing higher discounts, giving extra products or services, etc., and further stimulate their purchase intention through these measures, and provide detailed product information, open and transparent prices, clear return and exchange policies and safe payment methods during the sales process, and establish a perfect customer service system, quickly respond to questions and questions of consumers, and provide professional answers and help. The trust of consumers is enhanced through high-quality customer service, so that the product information can be more comprehensively understood, are willing to make higher-risk purchases, Improve their purchase intention agricultural products.

5.3 Research Shortcomings and Suggestions for Follow-up Research

This study only analyzes the impact on purchase intention from the perspectives of social relationship strength, product participation degree and perceived risk. The analysis of the influencing factors affecting the purchase intention of online agricultural products is insufficient, and the research perspective is relatively limited. However, different regions have different levels in the development of e-commerce industry and the construction of supporting industries. At the same time, different sales channels also have different situations. This study mainly focuses on the three aspects of social relationship strength, product participation and perceived risk. However, consumers ' economic status, personal taste preferences, health concerns, and the development level of local logistics, e-commerce and other industries may affect their willingness to purchase agricultural products. Therefore, follow-up research should further expand the perspective and comprehensively consider more factors that may affect the online purchase of agricultural products.

The selection of samples for this study has limitations. In the study, only a specific group of consumers, college students, was studied in depth. However, different consumer groups may have different influence factors on the purchase intention of agricultural products. Therefore, future research can be divided into different types of consumer groups and put forward more targeted suggestions. At the same time, due to the limitation of time and cost, the study cannot cover all types of agricultural products and marketing channels, and the purchase intention of different agricultural products and marketing channels may be affected by different factors. Therefore, future research can focus on different types of agricultural products and marketing channels.

This study has some shortcomings in exploring the complex relationship between variables. Although we have analyzed the influence of Strength of social ties, product participation on the purchase intention of agricultural products, and the mediating effect of perceived risk, the interaction and interaction among variables have not been fully considered in the model design. For example, social the increase of the relationship strength may not only directly affect the purchase intention, but also indirectly affect the purchase intention by increasing the degree of product participation. In addition, in the actual purchasing process, there may be other variables that influence the purchase intention and mediate or mediate between the strength of social relationship, the degree of product participation and perceived risk. The model design of this study only discusses the basic relationship among these variables, but fails to fully reveal the complex interactions among these variables. Therefore, future studies can further explore the relationship between these variables and look for potential mediators or regulators to improve the model design.

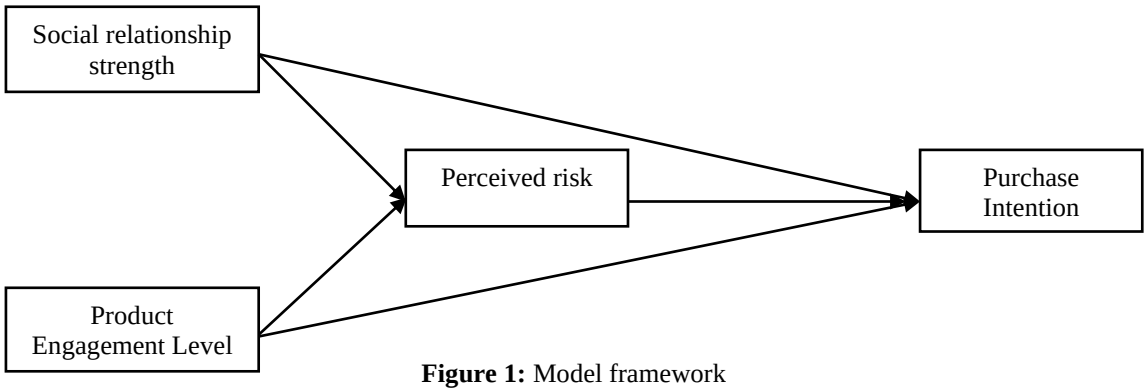

Figure 1: Model framework

CONFLICT OF INTEREST

The authors declare no conflicts of interest relevant to this study.

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