

## Research Article

## Farmers' intention to apply agricultural e-commerce: Extending the Technology Acceptance Model (TAM) with perceived enjoyment and perceived e-commerce self-efficacy

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**ABSTRACT-** E-commerce can play an increasingly strong role in boosting agricultural development. This study aimed to understand citrus growers' behavioral intention to apply agricultural e-commerce. The research used a cross-sectional survey of Jahrom citrus growers in Iran. So, 360 citrus growers were selected to participate in this study, and data were collected with a structured questionnaire. All the hypotheses relating to the Technology Acceptance Model (TAM) components, and those relating to the extended TAM were supported. Attitude, perceived e-commerce self-efficacy, perceived usefulness, perceived enjoyment, and perceived ease of use were the most important variables influencing citrus growers' behavioral intention. Improving farmers' agricultural e-commerce attitudes and skills through training programs and establishing stability in the market seems to be a useful strategy to develop their intention to use agricultural e-commerce.

## INTRODUCTION

E-commerce means buying or selling goods or services through the internet (Henderson et al., 2004; Huo & Mu, 2017; Ahmadi & Ghorbanpour, 2021). Three major categories of agricultural e-markets can be identified: 1- e-markets for agricultural products, operated by farmers or retailers, where they sell agricultural products to consumers, 2- e-markets run by agricultural companies, where they sell production factors and agricultural inputs to farmers, and 3- e-markets for services by third parties, where specialist support services are provided to farmers (Wilson, 2000; Dong & Tarofder, 2024; Azhar et al., 2024). Since the number of internet users has increased, many businesses have turned to e-commerce (McFarlane et al., 2003; Lin, 2019). Meanwhile, expanding Information Communications Technology (ICT), especially in rural areas (Jamaluddin, 2013), has significantly fueled the improvement of agricultural e-commerce (Wang et al., 2016; Putri et al., 2023).

Generally, agricultural e-commerce can provide many advantages to users and stakeholders. Examples of benefits include increased profitability, the elimination of intermediaries, greater market development for agricultural production, increasing awareness of market prices, more access to national and international markets, the promotion of agricultural products, increased

competition among suppliers of agricultural inputs, improved quality of agricultural products, increased revenues of farmers, and the acceleration of agricultural and rural economic structures (Liu et al., 2013; Asadihkoob & Ebrahimi, 2014). As a result, e-commerce can play a significant role in strengthening agricultural development (Cai et al., 2015). In Iran, agriculture is an important economic sector that accounts for a high percentage of production and employment and plays an impressive role in economic development. In Iran's Sixth Economic and Socio-Cultural Development Program, the growth rate of the agricultural sector is estimated to be 8%. One way to achieve this goal is to focus on crop markets. According to Omid Najafabadi (2010), traditional crop markets in Iran do not meet today's needs, and agricultural markets have suffered from some issues. The emergence of agricultural e-commerce in Iran could eliminate many challenges of production and marketing in the agricultural sector. Therefore, the main theme of this research was understanding citrus growers' intention towards applying agricultural e-commerce.

Meanwhile, the user's acceptance is the first step of any business, which is the main component of the further spread of new technology. According to Uzoka et al. (2007), apart from infrastructural factors, behavioral factors can also influence e-commerce acceptance. Although ICT acceptance has extensively been examined

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in the world, few studies have addressed agricultural e-commerce acceptance.

The Technology Acceptance Model (TAM) is the most dominant theory to describe people's acceptance of information systems (Gefen & Straub, 2000; Syaifei & Yulianto, 2024). Previously, the TAM and its extensive formats have been applied to the adoption of information systems or particular technologies (Biucky & Harandi, 2017; Hailemariam et al., 2024; Sönmez et al., 2024; Salimon et al., 2020). Davis (1989) used the TAM to show that the intention to apply an innovation is determined by attitude and perceived usefulness. The TAM consists of two components: perceived usefulness (PU) and perceived ease of use (PEU).

Therefore, we have extended the TAM in this research. In our model, after reviewing the e-commerce acceptance literature, we added "perceived enjoyment" and "perceived e-commerce self-efficacy" to improve the predictive power of the TAM. Our model used the TAM extension to study citrus growers' behavioral intentions of using agricultural e-commerce. Therefore, after reviewing the related studies in the field of technology acceptance, in line with Davis et al. (1992), perceived enjoyment was added to the TAM. Perceived enjoyment is a measure of intrinsic motivation that is included in the conceptual model. By doing this, both intrinsic and extrinsic utilities were considered in the conceptual model (Fig. 1). The concept of "perceived usefulness" has been widely used in technology acceptance studies. The importance of this variable for attitude and intention has been shown in many e-commerce studies (Ashraf, 2016; Basarir-Ozel & Mardikyan, 2017; Gan et al., 2018; Wilson, 2019; Sundjaja, 2020). Therefore, this research assumes the following hypotheses:

H1: PU has a significant impact on the attitude toward applying agricultural e-commerce.

H2: PU has a significant impact on the intention to apply agricultural e-commerce.

In the TAM, PEU is posited to have a significant influence on attitude. In the literature on e-commerce adoption and use, several studies have indicated the significant impact of the perceived ease of use on the users' attitude toward adopting e-commerce (Smith, 2008; Al Ziadat et al., 2013; Renny et al., 2013; Kanchanatanee et al., 2014). Thus, the following hypotheses are presented in this study:

H3: PEU has a positive and significant impact on the attitude toward applying agricultural e-commerce.

H4: PEU has a significant impact on the perceived usefulness of applying agricultural e-commerce.

Internal stimuli based on emotional appraisal have not been considered in the TAM. Thus, Davis et al. (1992) considered perceived enjoyment to be a form of internal motivation as opposed to perceived usefulness. The concept of "pleasure" in Mehrabian and Russell's (1974) theory is somewhat similar to the concept of "perceived enjoyment". Pleasure in this theory refers to a continuum ranging from extreme pain or unhappiness to extreme happiness. Pleasure in their theory is proposed to have a significant effect on the attitude toward behavior. Likewise, a similar factor to perceived enjoyment – perceived fun – was supported by Igbaria et al. (1994) as a factor predicting the use of technology. Several studies,

including those of Yu et al. (2005), Suki and Suki (2011), Cheema et al. (2013), Alalwan et al. (2018), and Manis and Choi (2019), have considered perceived enjoyment and found that perceived enjoyment has significant effects on the behavioral intention. Yu et al. (2005), Praveena and Thomas (2014), and Manis and Choi (2019) also showed that perceived enjoyment as a variable added to the TAM can influence the attitude toward behavior. In conclusion, the following hypotheses are proposed in this research:

H5: Perceived enjoyment has a significant impact on attitude toward using agricultural e-commerce.

H6: Perceived enjoyment has a significant impact on the intention to use agricultural e-commerce

Generally, self-efficacy is defined as people's beliefs about their ability to influence events that affect their lives (Bandura, 1997). Self-efficacy can be changed and developed over time by experience or practice. Kim et al. (2009) showed two types of self-efficacy, including general self-efficacy and specific self-efficacy. In many studies, we can find different types of specific self-efficacy. McDonald and Siegal (1992) and Hsu and Chiu (2004) identified web-specific self-efficacy and general Internet self-efficacy. In the field of Information Technology (IT), Roca et al. (2006) identified computer self-efficacy and Internet self-efficacy. They considered these two types of self-efficacy as perceived behavioral control. In this study, we consider e-commerce self-efficacy as the adequate and accurate aptitude and skill set to succeed when dealing with e-commerce. According to Davis (1989), self-efficacy is similar to perceived ease of use. Venkatesh and Davis (1996) also believe that self-efficacy and ease of use might be closely linked. Thus, in many studies, perceived self-efficacy and perceived ease of use are related to each other (Khan et al., 2024; Pan et al., 2024; Wibowo et al., 2024; Singh & Srivastava, 2020).

So, two hypotheses are considered in this research:

H7: Perceived e-commerce self-efficacy has a significant impact on the perceived ease of applying agricultural e-commerce.

H8: Perceived e-commerce self-efficacy has a significant impact on the intention to apply agricultural e-commerce.

Fishbein and Ajzen (1975) define attitude as a person's feelings (evaluative affect) about performing the target behavior. The TAM proposes that attitude has a positive effect on behavioral intention. The effect of attitude on intention has also been supported in the e-commerce domain (Kim, 2012; Nguyen et al., 2019; Ha & Nguyen, 2019). Therefore, this study assumes the following hypothesis:

H9: Attitude has a significant effect on the intention to use agricultural e-commerce.

Behavioral intention has been considered an important indicator of the occurrence of a behavior (Venkatesh et al., 2003). Fishbein and Ajzen (1975) define behavioral intention as the amount of effort one is willing to put into attaining a goal. This concept has a strong impact on future behavior (Bamberg, 2003). In this study, we hypothesize that if farmers have a stronger behavioral intention to use agricultural e-commerce, they are more likely to use it.

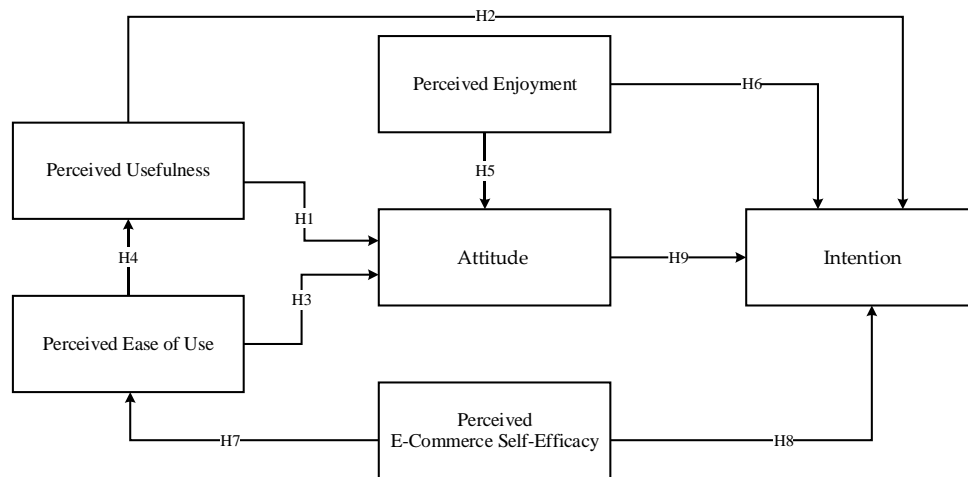


Fig. 1. The conceptual model of the research.

## MATERIALS AND METHODS

This study employs descriptive and correlational research methods using data collected in a survey with structured questionnaire distribution.

The survey instrument was divided into two parts: the personal section and the constructs-related section. The first section focused on age, education, farming experience, monthly income, and garden size. SPSS<sub>25</sub> software was used for descriptive analysis of the respondents' personal information. In the second section, citrus growers were asked to express their opinions using a 1-5 Likert scale with endpoints of "strongly agree= 5", "agree= 4", "undecided= 3", "disagree= 2," and "strongly disagree= 1". Exactly, 3566 Jahrom citrus growers were defined as the study population, and 360 citrus growers selected by stratified random sampling participated in the research (Khafr = 48, Central = 43, Kordian = 77, and Simakan = 192). A panel of experts confirmed the face validity of the measurement items. Cronbach's alpha was also used to determine the reliability of the measurement scales. The analysis showed that all the items had factor loadings higher than 0.7 and were, accordingly, significant (Table 1). The results revealed that all CRs were above 0.70, showing acceptable levels of reliability. Average variances extracted (AVE) were all over 0.50, proving that the constructs had acceptable convergent validity (Table 2).

The structural model was tested using the AMOS<sub>24</sub> procedure, a software package designed to perform the structural equation model approach to path analysis. Path analysis is a variation of multiple-regression analysis and is useful to analyze a number of issues involved in causal analysis (Stage et al., 2004).

## RESULTS AND DISCUSSION

In the samples, all citrus producers were male. Based on age, their average age was about 43 years and most of the respondents (42.8%) were 33-45 years. Based on the educational level, most of the respondents had under high school diploma education. Also, 30% of the citrus producers had diplomas or associate degrees and the rest (6.7%) had bachelor's degrees or higher (Table 3).

According to farming experience, most (44.7%) had 13-22 years of experience. The average of their monthly income was 1.7 million IRR. Based on the garden size, most of them (60.8%) had under five hectares. Furthermore, the average size of gardens was 1.4 hectares.

Table 4 shows the mean score of the variables used in this study. The lowest mean score of 2.18 went to perceived e-commerce self-efficacy, showing that the respondents perceived that their efficacy in engaging in e-commerce was somewhat low. The highest mean score was related to perceived usefulness.

The findings reveal that the goodness of fit index (GFI) score was above 0.9, the threshold suggested by Fornell & Larcker (1981). The root mean square error of approximation (RMSEA) score was below 0.05, which is acceptable. The scores of normed fit index (NFI) and non-normed fit index (NNFI) were both greater than 0.9. The score of comparative fit index (CFI) of 0.99 was greater than 0.95. Therefore, the model, which is presented in Fig. 2, was fitted. According to Imam (2005), the path coefficient is significant at the 0.05 level when the critical ratio is more than 1.96. According to Table 5, overall, all nine hypotheses were supported by the data. All the hypotheses relating to the TAM variables (H1 to H4 and H9), as well as those relating to the extended TAM (H5-H8), were significant. The variables of farmers' attitude, perceived usefulness (PU), perceived ease of use (PEU), perceived enjoyment (PE), and perceived e-commerce self-efficacy (PES) predicted behavioral intention ( $R^2 = 0.527$ ). This means that attitude, perceived e-commerce self-efficacy, perceived usefulness, perceived enjoyment, and perceived ease of use account for 52.7% of the variance in behavioral intention in our sample.

The most dominant determinant of behavioral intention was attitude, with an effect of 0.51 (Table 6). It indicates that a favorable attitude toward agricultural e-commerce has a substantial impact on the intention to use it.

The second dominant determinant of behavioral intention was perceived e-commerce self-efficacy with a total effect of 0.47. This finding is consistent with existing research showing a relationship between

perceived self-efficacy and intention (e.g., Ranganathan & Jha, 2007; Faqih, 2013; Suryani et al., 2020). PU, PE, and PEU had total effects of 0.42, 0.34, and 0.15 on intention, respectively. Together, these five variables (attitude, perceived e-commerce self-efficacy, perceived usefulness, perceived enjoyment, and perceived ease of use) accounted for 52.7% of the variance in the behavioral intention to use agricultural commerce, and just over 47% of the variance was left unexplained. This shows that the extended TAM by adding perceived self-efficacy and perceived enjoyment is a suitable model to

explain farmers' intention to apply agricultural e-commerce.

The most dominant determinant of attitude was perceived usefulness with a total effect of 0.37. This shows that when farmers perceive agricultural e-commerce to be more useful, their attitude towards it improves significantly. The path from perceived usefulness to intention is also positive (0.24) and significant (t-value = 3.56). This means that perceived usefulness influences users' intention to use the system, albeit to a lesser extent than it influences attitude.

**Table 1.** The measurement model of the research

Component	Factor loading ( $\lambda$ )	Composite reliability (CR)	Average of variance extracted (AVE)
PU: $\alpha=0.81$		0.78	0.65
PU1	0.86 ***		
PU2	0.72 ***		
PU3	0.70 ***		
PU4	0.93 ***		
PEU: $\alpha=0.75$		0.84	0.64
PEU1	0.83 ***		
PEU2	0.71 ***		
PEU3	0.87 ***		
PE: $\alpha=0.72$		0.75	0.62
PE1	0.94 ***		
PE2	0.72 ***		
PE3	0.70 ***		
PES: $\alpha=0.77$		0.88	0.68
PES1	0.93 ***		
PES2	0.71 ***		
PES3	0.83 ***		
PES4	0.82 ***		
Attitude: $\alpha=0.85$		0.94	0.68
Attitude1	0.85 ***		
Attitude2	0.94 ***		
Attitude3	0.87 ***		
Attitude4	0.76 ***		
Attitude5	0.70 ***		
Intention: Cronbach's $\alpha=0.78$		0.87	0.65
Intention1	0.87 ***		
Intention2	0.81 ***		
Intention3	0.72 ***		
Intention4	0.75 ***		
Intention5	0.89 ***		
Intention6	0.79 ***		

PU: perceived usefulness; PEU: perceived ease of use; PE: perceived enjoyment; PES: perceived e-commerce self-efficacy

\*\*\*  $P < 0.001$

**Table 2.** The results of Pearson correlation of the variables

Component	AVE	PU	PEU	PE	PES	Attitude	Intention
PU	0.65	0.78					
PEU	0.64	0.59**	0.78				
PE	0.62	0.35*	0.61**	0.73			
PES	0.68	0.40**	0.66***	0.54**	0.86		
Attitude	0.68	0.60**	0.52**	0.53**	0.44**	0.86	
Intention	0.65	0.30**	0.50**	0.37**	0.57**	0.64***	0.87

PU: perceived usefulness; PEU: perceived ease of use; PE: perceived enjoyment; PES: perceived e-commerce self-efficacy

\*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$ .

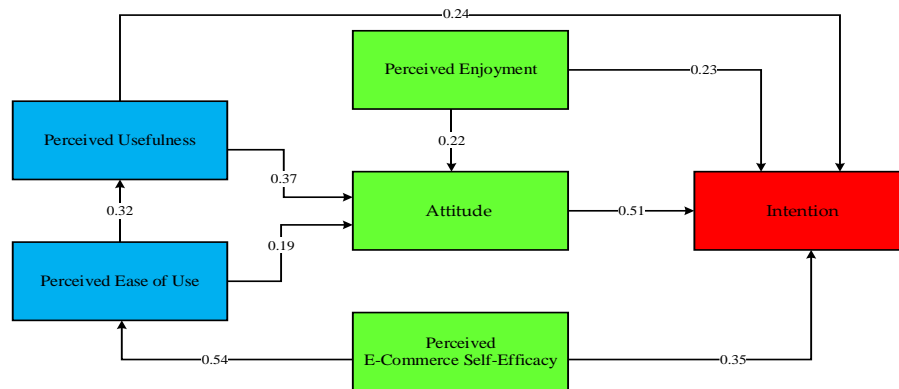
**Table 3.** The personal characteristics of the participants

Component	%	Mean
Age (years)		43.2
≤ 32	18.3	
33-45	42.8	
46-58	28.6	
59 and more	10.3	
Education (years)		-
Under diploma	63.3	
Diploma or associate degree	30.0	
Bachelor’s degree or more	6.7	
Farming experience (years)		16.7
≤ 12	33.6	
13-22	44.8	
23-32	14.7	
33 and more	6.9	
Monthly income (Million Rial)		1.7
≤ 1	3.3	
1.001- 2.5	40.3	
2.501-4	44.5	
4.001 and more	11.9	
Garden size (Hectare)		1.4
≤ 5	60.8	
6-11	33.1	
12 and more	6.1	

**Table 4.** A summary of descriptive finding

Component	Mean	S.D
PU	3.50	0.84
PEU	2.97	0.87
PE	3.37	1.04
PES	2.18	1.06
Attitude	3.37	0.84
Intention	3.26	0.97

PU: perceived usefulness; PEU: perceived ease of use; PE: perceived enjoyment; PES: perceived e-commerce self-efficacy  
Scale: 1-5



**Fig. 2.** The model of best-fit.

**Table 5.** The result of hypothesis testing

Path	Hypothesis	Standardized path coefficient	t-value
PU → Attitude	H1	0.37**	7.19
PU → Intention	H2	0.24**	3.56
PEU → Attitude	H3	0.19**	3.24
PEU → Perceived usefulness	H4	0.32**	4.78
PE → Attitude	H5	0.22**	3.32
PE → Intention	H6	0.23**	3.50
PES → Perceived ease of use	H7	0.54**	7.65
PES → Intention	H8	0.35***	6.66
Attitude → Intention	H9	0.51***	7.51

PU: perceived usefulness; PEU: perceived ease of use; PE: perceived enjoyment; PES: perceived e-commerce self-efficacy

\*\* $p < 0.01$       \*\*\* $p < 0.001$

**Table 6.** A summary of the effects of the variables

Path		Standardized estimate		
		Direct	Indirect	Total
Intention ( $R^2 = 0.527$ )	ATT	0.51	-	0.51
	PU	0.24	0.18	0.42
	PEU	-	0.15	0.15
	PE	0.23	0.11	0.34
	PES	0.35	0.12	0.47
Attitude ( $R^2 = 0.444$ )	PU	0.37	-	0.37
	PEU	0.19	-	0.19
	PE	0.22	-	0.22
Perceived usefulness ( $R^2 = 0.185$ )	PEU	0.32	-	0.32
Perceived ease of use ( $R^2 = 0.238$ )	PES	0.54	-	0.54

PU: perceived usefulness; PEU: perceived ease of use; PE: perceived enjoyment; PES: perceived e-commerce self-efficacy

Overall, the three determinants (perceived usefulness, perceived enjoyment, and perceived ease of use) accounted for 44.4% of the variance in attitude. In summary, this finding highlights the importance of these three factors in shaping attitudes and shows that they are critical elements that should be considered in any strategy related to the development of agricultural e-commerce among farmers.

Perceived ease of use had a direct effect of 0.32 on perceived usefulness. This result is consistent with the TAM. In more detail, this means that individuals who find certain technology easy to use are likely to view it as more useful in achieving their goals or tasks. Perceived e-commerce self-efficacy had a significant and direct effect on perceived ease of use (Fig. 2). This result supports existing research that indicates the effect of perceived self-efficacy on perceived ease of use (Ramayah & Aafaqi, 2004; Abdullah et al., 2016; Zhang et al., 2017).

## CONCLUSION

The emergence of e-commerce has motivated widespread global research aimed at advancing our understanding of e-commerce acceptance and usage in varying environmental settings. The major contribution of this survey was to empirically improve a theoretical framework to identify the citrus growers' intention to use agricultural e-commerce. A conceptual research model was used based on the extended form of the TAM by adding two external variables (perceived e-commerce self-efficacy and perceived enjoyment). Quantitative data were collected with a questionnaire. In total, the findings illustrated that the extended TAM was significant in explaining citrus producers' intentions. Attitude to use, perceived e-commerce self-efficacy, PU, PE, and PEU explained 52.7% of the variance in behavioral intention. Therefore, about 53% of the variance in intention was explained by the model, which is a relatively strong explanatory power. The developed TAM presented in this research can be used by agricultural e-commerce promoters to improve appropriate factors to increase farmers' intention to apply agricultural e-commerce in the future.

Therefore, agricultural e-commerce practitioners have to concentrate on the variables of attitude, perceived e-commerce self-efficacy, perceived usefulness, perceived enjoyment, and PEU to improve farmers' intention to apply agricultural e-commerce. The findings

are in line with the results of some studies such as Hailemariam et al. (2024), Agarwal and Karahanna (2000), Khan et al. (2024), Pan (2024), Sönmez et al. (2024), Thongsri et al. (2019), and Singh and Srivastava, (2020).

There was a main impact of attitude on citrus producers' behavioral intention. Therefore, improving farmers' attitudes towards using agricultural e-commerce through extensional and educational programs is recommended.

Also, attitude itself is influenced by perceived usefulness, perceived ease of use, and perceived enjoyment. In summary, attitude toward agricultural e-commerce is influenced by how useful, easy to use, and enjoyable farmers perceive the agricultural e-commerce experience is. A positive outlook in these areas will likely encourage more frequent and enthusiastic use of agricultural e-commerce activities.

Perceived e-commerce self-efficacy is considered the second most important variable that directly affects the intention. This underlines the importance of self-efficacy for participation in agricultural e-commerce. In practical terms, improving users' self-efficacy through training can increase their intention to interact with agricultural e-commerce.

Moreover, our study demonstrated that perceived e-commerce self-efficacy had a direct impact on PEU. This result illustrates that when farmers believe that they have the adequate aptitudes and skills to succeed in e-commerce, they come into a stronger belief that the use of e-commerce will be effortless.

It should be noted that perceived self-efficacy as a variable added to the TAM has been widely confirmed by some studies such as Igbaria and Iivari (1995), Rahmawati (2019), Chen et al. (2022), and Silvertre et al. (2022).

PE was also a predictor of farmers' attitudes and intentions, confirming the role of intrinsic motivation in increasing attitudes and intentions to use agricultural e-commerce. It should be noted that the role of PE as a variable added to the TAM has extensively been validated and confirmed by studies on IT (Yu, 2005; Suki & Suki, 2011; Cheema, 2013; Alalwan et al., 2018; Manis & Choi, 2019). Therefore, policymakers in the agricultural sector can focus on designing educational programs that also highlight the enjoyable aspects of using e-commerce. This can lead to increased adoption of agricultural e-commerce among farmers.

Finally, 47% of the variance in behavioral intention is unexplained in our proposed model. Therefore, it is recommended to conduct more research on the behavioral intention of farmers to adopt agricultural e-commerce.

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## CRedit AUTHORSHIP CONTRIBUTION STATEMENT

Conceptualization: Raha Zarei and Gholam-Hossein Zamani; Methodology: Raha Zarei and Gholam-Hossein Zamani; Software: Raha Zarei, Hamid Karimi, and Pouria Ataei; Validation: Raha Zarei, Gholam-Hossein Zamani, and Hamid Karimi; Formal analysis: Raha Zarei; Investigation: Raha Zarei and Gholam-Hossein Zamani; Resources: Raha Zarei and Gholam-Hossein Zamani; Data curation: Raha Zarei and Hamid Karimi; Writing-original Draft preparation: Raha Zarei; Writing-review and Editing: Raha Zarei, Hamid Karimi, and Pouria Ataei; Visualization: Pouria Ataei; Supervision: Gholam-Hossein Zamani; Project administration: Raha Zarei and Gholam-Hossein Zamani.

## DECLARATION OF COMPETING INTEREST

The authors declare no conflict of interest.

## ETHICAL STATEMENT

In this study, no human or animal experiments were performed.

## DATA AVAILABILITY

The data supporting the findings of this study are available from the corresponding author upon request.

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## REFERENCES

- Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' perceived ease of use (PEOU) and perceived usefulness (PU) of e-portfolios. *Computers in Human Behavior*, 63, 75-90. <https://doi.org/10.1016/j.chb.2016.05.014>
- Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 24(4), 665-694. <https://doi.org/10.2307/3250951>
- Ahmadi, S., & Ghorbanpour, S. (2021). Smart Controlling cyanide emissions from surface water resources by predictive models: An integrated GA-Regression. *Journal of Research in Science, Engineering and Technology*, 9(01), 38-49. <https://doi.org/10.24200/jrset.vol9iss01pp38-49>
- Al Ziadat, M. T., Al-Majali, M. M., Al Muala, A. M., & Khawaldeh, K. H. (2013). Factors affecting university student's attitudes toward e-commerce: Case of Mutah University. *International Journal of Marketing Studies*, 5(5), 88-93. <https://doi.org/10.5539/ijms.v5n5p88>
- Alalwan, A. A., Baabdullah, A. M., Rana, N. P., Tamilmani, K., & Dwivedi, Y. K. (2018). Examining adoption of mobile internet in Saudi Arabia: Extending TAM with perceived enjoyment, innovativeness and trust. *Technology in Society*, 55, 100-110. <https://doi.org/10.1016/j.techsoc.2018.06.007>
- Asadihkoob, H., & Ebrahimi, M. S. (2014). Challenges and strategies of e-commerce in Iran's agriculture. *Agricultural Communications*, 2(1), 80-88.
- Ashraf, A. R., Thongpapanl, N. T., & Spyropoulou, S. (2016). The connection and disconnection between e-commerce businesses and their customers: Exploring the role of engagement, perceived usefulness, and perceived ease-of-use. *Electronic Commerce Research and Applications*, 20, 69-86. <https://doi.org/10.1016/j.elerap.2016.10.001>
- Azhar, N., Yap, C. K., Nulit, R., Omar, H., Syazwan, W. M., & Leow, C. S. (2024). A preliminary study of direct observation and selected water quality monitoring in Putrajaya Lake: The status between October-December 2022. *International Journal of Sustainable Energy and Environmental Research*, 13(1), 25-35. <https://doi.org/10.18488/13.v13i1.3682>
- Bamberg, S. (2003). How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *Journal of Environmental Psychology*, 23(1), 21-32. [https://doi.org/10.1016/S0272-4944\(02\)00078-6](https://doi.org/10.1016/S0272-4944(02)00078-6)
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Worth Publishers.
- Basarir-Ozel, B., & Mardikyan, S. (2017). Factors affecting e-commerce adoption: A case of Turkey. *The International Journal of Management Science and Information Technology (IJMSIT)*, (23), 1-11.
- Biucky, S. T., & Harandi, S. R. (2017). The effects of perceived risk on social commerce adoption based on tam model. *International Journal of Electronic Commerce Studies*, 8(2), 173-196. <https://doi.org/10.7903/ijecs.1538>
- Cai, Y., Lang, Y., Zheng, S., & Zhang, Y. (2015). Research on the influence of e-commerce platform to agricultural logistics: An empirical analysis based on agricultural product marketing. *International Journal of Security and Its Applications*, 9(10), 287-296. <http://dx.doi.org/10.14257/ijssia.2015.9.10.26>
- Cheema, U., Rizwan, M., Jalal, R., Durrani, F., & Sohail, N. (2013). The trend of online shopping in 21st century: Impact of enjoyment in TAM Model. *Asian Journal of Empirical Research*, 3(2), 131-141.
- Chen, T., Chen, J., Or, C. K., & Lo, F. P. (2022). Path analysis of the roles of age, self-efficacy, and TAM constructs in the acceptance of performing upper limb exercises through immersive virtual reality games. *International Journal of Industrial Ergonomics*, 91, 103360. <https://doi.org/10.1016/j.ergon.2022.103360>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340. <https://doi.org/10.2307/249008>
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of

- two theoretical models. *Management Science.*, 35(8), 982-1003.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22(14), 1111-1132. <https://doi.org/10.1111/j.1559-1816.1992.tb00945.x>
- Dong, Y., & Tarofder, A. K. (2024). Beyond the screen: How affection drives impulsive purchases in livestreaming e-commerce. *International Journal of Applied Economics, Finance and Accounting*, 18(1), 168-179. <https://doi.org/10.33094/ijaefa.v18i1.1338>
- Faqih, K. M. (2013). Exploring the influence of perceived risk and internet self-efficacy on consumer online shopping intentions: Perspective of technology acceptance model. *International Management Review*, 9(1), 67-77.
- Fishbein, M., & Ajzen, I. (1975). *Intention and Behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.2307/3151312>
- Gan, X., Jiao, Y., Liu, L., & Zhang, Y. (2018). Research on the factors influencing users' adoption intention of e-commerce recommendation system. In *International Conference on Data Mining and Big Data* (pp. 563-574). Springer, Cham.
- Gefen, D., & Straub, D. W. (2000). The relative importance of perceived ease of use in IS adoption: A study of e-commerce adoption. *Journal of the Association for Information Systems*, 1(1), 1-8. <https://doi.org/10.17705/1jais.00008>
- Ha, N., & Nguyen, T. (2019). The effect of trust on consumers' online purchase intention: An integration of TAM and TPB. *Management Science Letters*, 9(9), 1451-1460.
- Hailemariam, T., Atnafu, A., Gezie, L., Kaasbøll, J., Klein, J., & Tilahun, B. (2024). Intention to use an electronic community health information system among health extension workers in rural northwest Ethiopia: Cross-sectional study using the unified theory of acceptance and use of technology 2 model. *JMIR Human Factors*, 11(1), e47081. <https://doi.org/10.2196/47081>
- Henderson, J., Dooley, F., & Akridge, J. (2004). Internet and e-commerce adoption by agricultural input firms. *Review of Agricultural Economics*, 26(4), 505-520. <https://www.jstor.org/stable/3700794>
- Hsu, M. H., & Chiu, C. M. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems*, 38(3), 369-381. <https://doi.org/10.1016/j.dss.2003.08.001>
- Huo, Y., & Mu, H. (2017). *Research on the development of E-commerce model of agricultural products*. Retrieved from: [https://www.mateconferences.org/articles/mateconf/abs/2017/14/mateconf\\_gcmm2017\\_02040/mateconf\\_gcmm2017\\_02040.html/](https://www.mateconferences.org/articles/mateconf/abs/2017/14/mateconf_gcmm2017_02040/mateconf_gcmm2017_02040.html/)
- Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omega*, 23(6), 587-605. [https://doi.org/10.1016/0305-0483\(95\)00035-6](https://doi.org/10.1016/0305-0483(95)00035-6)
- Igbaria, M., Schiffman, S. J., & Wieckowski, T. J. (1994). The respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology. *Behaviour and Information Technology*, 13(6), 349-361. <https://doi.org/10.1080/01449299408914616>
- Imam, G. (2005). *Model persamaan struktural: Konsep dan aplikasi dengan program AMOS Ver. 5.0*. Badan penerbit UNDIP: Semarang.
- Jamaluddin, N. (2013). Adoption of e-commerce practices among the Indian farmers, a survey of Trichy district in the state of Tamilnadu, India. *Procedia Economics and Finance*, 7, 140-149. [https://doi.org/10.1016/S2212-5671\(13\)00228-1](https://doi.org/10.1016/S2212-5671(13)00228-1)
- Kanchanatanee, K., Suwanno, N., & Jarernvongrayab, A. (2014). Effects of attitude toward using, perceived usefulness, perceived ease of use and perceived compatibility on intention to use E-marketing. *Journal of Management Research*, 6(3), 1-13.
- Khan, S., Zhang, Q., Khan, S. U., Khan, I. U., & Khan, R. U. (2024). Understanding mobile augmented reality apps in Pakistan: An extended mobile technology acceptance model. *Journal of Tourism Futures*. <https://doi.org/doi:10.1108/JTF-04-2022-0131>
- Kim, I. S. (2009). The role of self-efficacy and social support in the relationship between emotional labor and burn out, turn over intention among hospital nurses. *Journal of Korean Academy of Nursing Administration*, 15(4), 515-526.
- Kim, J. B. (2012). An empirical study on consumer first purchase intention in online shopping: integrating initial trust and TAM. *Electronic Commerce Research*, 12(2), 125-150. <https://doi.org/10.1007/s10660-012-9089-5>
- Lin, Y. (2019). E-urbanism: E-commerce, migration, and the transformation of Taobao villages in urban China. *Cities*, 91, 202-212. <https://doi.org/10.1016/j.cities.2018.11.020>
- Liu, H., Wang, Y., & Xie, K. (2013). Agricultural E-commerce sites evaluation research. *International Journal of Business and Social Science*, 4(17), 138- 143.
- Manis, K. T., & Choi, D. (2019). The virtual reality hardware acceptance model (VR-HAM): Extending and individuating the technology acceptance model (TAM) for virtual reality hardware. *Journal of Business Research*, 100, 503-513. <https://doi.org/10.1016/j.jbusres.2018.10.021>
- McDonald, T., & Siegall, M. (1992). The effects of technological self-efficacy and job focus on job performance, attitudes, and withdrawal behaviors. *The Journal of Psychology*, 126(5), 465-475. <https://doi.org/10.1080/00223980.1992.10543380>
- McFarlane, D., Chembezi, D., & Befecadu, J. (2003). Internet adoption and use of e-commerce strategies by agribusiness firms in Alabama. Southern Agricultural Economics Association Annual Meeting, Mobile, AL (pp. 1-5).
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. Cambridge: The MIT Press.
- Nguyen, T. T. H., Nguyen, N., Nguyen, T. B. L., Phan, T. T. H., Bui, L. P., & Moon, H. C. (2019). Investigating consumer attitude and intention towards online food purchasing in an emerging economy: An extended TAM approach. *Foods*, 8(11), 576.



- <https://doi.org/10.3390/foods8110576>
- Omidi Najafabadi, M. (2010). E-Marketing barriers from agricultural experts' perception. *African Journal of Business Management*, 4(14), 3226-3228.
- Pan, Z., Xie, Z., Liu, T., & Xia, T. (2024). Exploring the key factors influencing college students' willingness to use AI coding assistant tools: An expanded technology acceptance model. *Systems*, 12(5). <https://doi.org/10.3390/systems12050176>
- Praveena, K., & Thomas, S. (2014). Continuance intention to use Facebook: A study of perceived enjoyment and TAM. *Bonfring International Journal of Industrial Engineering and Management Science*, 4(1), 24-29.
- Putri, N. A., Hindersah, R., & Suryatmana, P. (2023). Effect of cow manure on instead mon the growth of water spinach in gold mine tailings. *Current Research in Agricultural Sciences*, 10(1), 33-40. <https://doi.org/10.18488/cras.v10i1.3414>
- Rahmawati, R. N. (2019). Self-efficacy and use of e-learning: A theoretical review technology acceptance model (TAM). *American Journal of Humanities and Social Sciences Research*, 3(5), 41-55.
- Ramayah, T., & Aafaqi, B. (2004). Role of self-efficacy in e-library usage among students of a public university in Malaysia. *Malaysian Journal of Library & Information Science*, 9(1), 39-57.
- Ranganathan, C., & Jha, S. (2007). Examining online purchase intentions in B2C e-commerce: testing an integrated model. *Information Resources Management Journal (IRMJ)*, 20(4), 48-64. <https://doi.org/10.4018/978-1-59904-978-6.ch014>
- Renny, Guritno, S., & Siringoringo, H. (2013). Perceived usefulness, ease of use, and attitude towards online shopping usefulness towards online airlines ticket purchase. *Procedia - Social and Behavioral Sciences*, 81, 212-216. <https://doi.org/10.1016/j.sbspro.2013.06.415>
- Roca, J. C., Chiu, C. M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. *International Journal of Human-computer Studies*, 64(8), 683-696. <https://doi.org/10.1016/j.ijhcs.2006.01.003>
- Salimon, M. G., Mohd Mokhtar, S. S., & Yusr, M. M. (2020). E-banking as a financial supply chain system: Can e-TAM improve trust and the rate of adoption? *International Journal of Supply Chain Management*, 9(2), 216-226. <https://doi.org/10.59160/ijscm.v9i2.4583>
- Silvertre, E., Miranda, A. M., & Gutiérrez, V. F. (2022). Validation of a Technology Acceptance Model (TAM) in Dominican university students. *Education*, 31(60), 113-136. <https://doi.org/10.18800/educacion.202201.005>
- Singh, S., & Srivastava, R. K. (2020). Understanding the intention to use mobile banking by existing online banking customers: an empirical study. *Journal of Financial Services Marketing*, 25, 86-96. <https://doi.org/10.1057/s41264-020-00074-w>
- Smith, T. J. (2008). Senior citizens and e-commerce websites: The role of perceived usefulness, perceived ease of use, and web site usability. *Informing Science*, 11, 59-83. <https://doi.org/10.28945/3268>
- Sönmez, F., Aydin, U., & Perdahci, Z. N. (2024). Investigation of university websites from technology acceptance model and information architecture perspective: A case study. *Journal of Information Science*, 50(2), 466-480. <https://doi.org/10.1177/01655515221094436>
- Stage, F. K., Carter, H. C., & Nora, A. (2004). Path analysis: An introduction and analysis of a decade of research. *The Journal of Educational Research*, 98(1), 5-13. <https://doi.org/10.3200/JOER.98.1.5-13>
- Suki, N. M., & Suki, N. M. (2011). Exploring the relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3G mobile services. *Journal of Information Technology Management*, 22(1), 1-7.
- Sundjaja, A. M., Arisanto, G. V., & Fatimah, S. (2020). The determinant factors of e-commerce usage behavior during flash sale program. *CommIT (Communication and Information Technology) Journal*, 14(2), 65-72. <https://doi.org/10.21512/commit.v14i2.6582>
- Suryani, D., Kurniawan, A., & Umiyati, I. (2020). IT self-efficacy, IT anxiety dan Minat menggunakan e-money. *Journal Riset Akuntansi dan Keuangan*, 8(1), 89-108. <https://doi.org/10.17509/jrak.v8i1.20387>
- Syafei, W. A., & Yulianto, A. (2024). Measuring acceptance levels of webcast-based E-learning to improve remote learning quality using technology acceptance model. *Journal of Information and Communication Convergence Engineering*, 22(1), 23-32. <https://doi.org/10.56977/jicce.2024.22.1.23>
- Thongsri, N., Shen, L., & Bao, Y. (2019). Investigating academic major differences in perception of computer self-efficacy and intention toward e-learning adoption in China. *Innovations in Education and Teaching International*, 57(5), 577-589. <https://doi.org/10.1080/14703297.2019.1585904>
- Uzoka, F. M. E., Shemi, A. P., & Seleka, G. G. (2007). Behavioral influences on e-commerce adoption in a developing country context. *The Electronic Journal of Information Systems in Developing Countries*, 31(1), 1-15. <https://doi.org/10.1002/j.1681-4835.2007.tb00213.x>
- Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision sciences*, 27(3), 451-481. <https://doi.org/10.1111/j.1540-5915.1996.tb00860.x>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478. <https://doi.org/10.2307/30036540>
- Wang, J., Zhu, X., & Zhang, C. (2016). Models of China's e-commerce in the agricultural sector: An exploratory study. *International Journal of U-and E-Service, Science and Technology*, 9(4), 389-400. <http://dx.doi.org/10.14257/ijunesst.2016.9.4.38>
- Wibowo, A., Saptono, A., Narmaditya, B. S., Effendi, M. S., Mukhtar, S., & Shafiai, M. H. M. (2024). Using technology acceptance model to investigate digital business intention among Indonesian students. *Cogent Business and Management*, 11(1). <https://doi.org/10.1080/23311975.2024.2314253>

- Wilson, N. (2019). The impact of perceived usefulness and perceived ease-of-use toward repurchase intention in the Indonesian e-commerce industry. *Journal Manajemen Indonesia*, 19(3), 241-249.
- Wilson, P. (2000). An overview of developments and prospects for e-commerce in the agricultural sector. Retrieved from:  
[http://ap.fftc.agnet.org/ap\\_db.php?id=599&print=1/](http://ap.fftc.agnet.org/ap_db.php?id=599&print=1/)
- Yu, J., Ha, I., Choi, M., & Rho, J. (2005). Extending the TAM for a t-commerce. *Information & Management*, 42(7), 965-976.  
<https://doi.org/10.1016/j.im.2004.11.001>
- Zhang, X., Han, X., Dang, Y., Meng, F., Guo, X., & Lin, J. (2017). User acceptance of mobile health services from users' perspectives: The role of self-efficacy and response-efficacy in technology acceptance. *Informatics for Health and Social Care*, 42(2), 194-206.  
<https://doi.org/10.1080/17538157.2016.1200053>