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Research Paper

IoT Adoption in Agriculture: Linking Technology Readiness, Acceptance and Entrepreneurial Ambidexterity Among Small-scale Farmers in Sabah

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Abstract

The adoption of Internet of Things (IoT) technologies in agriculture has the potential to enhance productivity, efficiency, and sustainability. However, small-scale farmers often face barriers related to technological capability, acceptance, and limited resources. The Sabah state's alarming long-term food security is further challenged by a declining workforce and limited productivity. Understanding the readiness and acceptance of Sabahan farmers towards IoT adoption is therefore needed in shaping effective interventions. The goals of this study are (i) to investigate the influence of technology readiness on technology acceptance within a technology readiness–acceptance framework; (ii) to examine the effects of perceived usefulness and perceived ease of use on IoT adoption intention; and (iii) to analyse the mediating role of entrepreneurial ambidexterity in strengthening the relationship between technology acceptance and adoption intention among small-scale farmers in Sabah. A cross-sectional quantitative research design was applied, with data collected from small-scale farmers using proportionate stratified random sampling. The dataset was analysed using partial least squares structural equation modeling (PLS-SEM) to test the research framework. The findings demonstrate that (i) technology readiness motivators significantly influence technology acceptance, (ii) perceived usefulness is the strongest predictor of IoT adoption intention, and (iii) entrepreneurial ambidexterity plays a significant mediating role, particularly through perceived ease of use. This study contributes to providing empirical evidence on the behavioural factors shaping IoT adoption among smallholder farmers. The results propose practical directions for policymakers, agricultural technology providers and stakeholders in designing strategies that align with farmers' readiness and support the digital transformation of Sabah's agricultural sector.

Keywords: *Technology Acceptance, Technology Readiness, Technology Adoption Intention, Entrepreneurial Ambidexterity*

INTRODUCTION

Sabah state, as a major contributor to Malaysia's agricultural output, continues to face persistent structural challenges, including low productivity, limited technology adoption, inadequate infrastructure, labour shortages, and fragmented policy support in its agrofood sector (DOSM, 2023; EPU, 2021; Jabatan Pertanian Sabah, 2022; Suffian & Suffian, 2022). Local food production remains insufficient to meet demand, resulting in growing reliance on imports and concerns over long-term food security (Jabatan Pertanian Sabah, 2022; Malay Mail, 2022). Small-scale farmers, the backbone of Sabah's agriculture, are most affected by these constraints, often struggling with low income, restricted market access, and stagnant productivity (Yusof & Annuar, 2023). The state's declining food self-sufficiency ratio creates the urgency for modernisation and sustainable transformation. Digital agriculture and smart farming, particularly through the integration of Internet of Things (IoT) technologies, offer viable pathways to enhance efficiency, productivity, and sustainability, which has been demonstrated globally (Government of Western Australia, 2021; SmartAgriHubs, 2023). In Malaysia, however, smallholder adoption remains limited despite government incentives due to complicated challenges (Aris et al., 2021; MAFS, 2023;

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Mat Lazim et al., 2020; Sinha & Dhanalakshmi, 2022).

Existing studies tend to emphasise external barriers, overlooking individual-level determinants upon technology adoption such as technology readiness, acceptance and in relation to farmers' entrepreneurial activities (Aris et al., 2021; Mohd Yaakub et al, 2024). This study, through quantitative research methods, addresses these gaps by aiming to investigate on (i) how technology readiness influences acceptance, (ii) how technology acceptance influences IoT adoption intention, and (iii) how entrepreneurial ambidexterity mediates this relationship towards IoT adoption intention among small-scale farmers in Sabah. The findings contribute both theoretically and practically, proposing a framework for IoT adoption intention and policy-relevant future directions for agricultural stakeholders.

LITERATURE REVIEW

The Malaysian government, through policies such as the *National Agrofood Policy 2021–2030* and the *Sabah Maju Jaya* plan, emphasises entrepreneurship and technological adoption, such as IoT, as enablers of efficiency and food security (MAFI, 2021; Sabah State Government, 2021). Its viability, however, remains limited (Abu Dardak et al., 2022; Ahmad et al., 2025; Hashim, 2022; Ministry of Digital, 2025). Socioeconomic constraints compounded by demographic issues like ageing farmers and limited youth participation continue to impede technology adoption (Aris et al., 2021; Bujang & Bakar, 2019; Harun et al., 2015; Mat Lazim et al., 2020; Mohd Yaakub et al., 2024; Yusof & Annuar, 2023). Effective IoT adoption, too, depends on individual psychological factors, including optimism, innovativeness, discomfort, and insecurity; attributes that shape perceptions of usefulness and ease of use (Adnan et al., 2019; Ahmad et al., 2025; Ahmad Tarmizi et al., 2020; Shariff et al., 2022; Zaman et al., 2023). Entrepreneurial ambidexterity, the capacity to explore new opportunities while exploiting existing resources, could further strengthen farmers' intention to embrace innovation (Cegarra-Sánchez et al., 2020; Chen & Yu, 2022; March, 1991). Analysing the role of behavioural dimensions could bridge the gap between policy aspirations and technology uptake (Bahari et al., 2024). Accordingly, this study examines: (i) the effects of technology readiness on technology acceptance, (ii) the influence of technology acceptance on IoT adoption intention, and (iii) the mediating role of entrepreneurial ambidexterity among small-scale farmers in Sabah.

Theoretical background

Technology acceptance explains the conditions influencing individuals' decisions to adopt or reject innovations. Among available models, the Technology Acceptance Model (TAM) (Davis, 1989) remains the most applied in agricultural studies, particularly among smallholder farmers (King & He, 2006; Mohd Yaakub et al., 2024); and proved that adoption intention is primarily shaped by perceived usefulness and ease of use as validated in rural settings across Italy, Thailand and China (Mohd Yaakub et al., 2024). Although TAM is criticised for oversimplification, its explanatory capacity improves when integrated with the Technology Readiness Index (TRI) (Parasuraman, 2000; Parasuraman & Colby, 2015), which captures psychological predispositions such as optimism, innovativeness, discomfort, and insecurity (Chiu & Cho, 2020; Mohr & Kühl, 2021; Montes de Oca Munguia et al., 2021; Sorce & Issa, 2021; Taherdoost, 2018). The integrated framework known as the Technology Readiness and Acceptance Model (TRAM), therefore, brings an extensive perspective for analysing IoT adoption in Sabah (Lin et al., 2007). Entrepreneurial ambidexterity supplements this framework by explaining the roles of individuals' exploration and exploitation activities in adopting IoT in agriculture. Adapted from organisational theory (Duncan, 1976; March, 1991), ambidexterity describes adaptive and innovative behaviour of farmers to experiment with emerging technologies like IoT while maintaining efficiency through optimised existing practices. This capability, driven by opportunity recognition and perceived benefits trigger proactive learning and risk-taking; therefore, mediating the link between technology readiness, acceptance, and adoption intention (Davis, 1989; He & Wong, 2004; Porter, 1985; Snehvrat et al., 2022; Vroom, 1964).

Hypothesis development and research framework

This study combines TRI and TAM to explain farmers' IoT adoption intentions (Lin et al., 2007). The motivators of technology readiness (optimism and innovativeness) are expected to enhance acceptance, reflecting positive attitudes and openness to experimentation (Parasuraman, 2000; Rogers, 2003; Parasuraman & Colby, 2015; Negm, 2023a). Conversely, discomfort and insecurity are inhibitors, likely reducing acceptance due to fear or uncertainty toward new technologies (Chiu & Cho, 2021; Kim & Chiu, 2019; Lin et al., 2007; Negm, 2023a). These relationships form hypotheses H1a–H2d (Figure 1).

Perceived usefulness and ease of use directly and indirectly influence IoT adoption intentions. Consistent with TAM, perceived usefulness positively relates to adoption, while ease of use shapes intention indirectly by improving perceptions of usefulness (H3a-H3c) (Davis, 1989; Dillon & Morris, 1996). For farmers, benefits often outweigh usability, though simple and user-friendly systems could still encourage learning and later increase perceived usefulness (Blut & Wang, 2020; Buyle et al., 2018; Michels et al., 2021; Venkatesh & Davis, 2000).

Entrepreneurial ambidexterity is introduced as a mediator, representing farmers' ability to balance exploration (trying new methods) and exploitation (refining existing practices) (March, 1991). When technology is perceived as beneficial and easy to use, farmers are more likely to experiment and apply it effectively (Benner & Tushman, 2003; Jansen et al., 2006; Mishra et al., 2024). This mediating role links technology acceptance towards adoption intention (H4a–H5d). Ambidexterity is expected to directly influence adoption, as ambidextrous farmers are better equipped to use IoT for both innovation and operational improvement (H6a-H6b) (Asif & de Vries, 2015; Drucker, 1985; Teece et al., 1997). The integrated conceptual framework is summarised in Figures 1 and 2.

Objective	Hypothesis	Statement
Objective 1 Relationship of Technology Readiness dimensions towards Technology Acceptance dimensions in Intention to Adopt IoT	**H1a**	*Optimism* positively influences *perception of usefulness* in intention to adopt IoT amongst small scale farmers in Sabah
	H1b	*Innovativeness* positively influences *perception of usefulness* in intention to adopt IoT amongst small scale farmers in Sabah
	H1c	*Discomfort* negatively influences *perception of usefulness* in intention to adopt IoT amongst small scale farmers in Sabah
	H1d	*Insecurity* negatively influences *perception of usefulness* in intention to adopt IoT amongst small scale farmers in Sabah
	H2a	*Optimism* positively influences *perception of ease of use* in intention to adopt IoT amongst small scale farmers in Sabah
	H2b	*Innovativeness* positively influences *perception of ease of use* in intention to adopt IoT amongst small scale farmers in Sabah
	H2c	*Discomfort* negatively influences *perception of ease of use* in intention to adopt IoT amongst small scale farmers in Sabah
	H2d	*Insecurity* negatively influences *perception of ease of use* in intention to adopt IoT amongst small scale farmers in Sabah
Objective 2 Relationship of Technology Acceptance dimensions towards Intention to Adopt IoT	**H3a**	*Perception of usefulness* positively influences the intention to adopt IoT amongst small scale farmers in Sabah
	H3b	*Perception of ease of use* positively influences the intention to adopt IoT amongst small scale farmers in Sabah
	H3c	*Perception of usefulness* mediates *perception of ease* of use towards the intention to adopt IoT amongst small scale farmers in Sabah
Objective 3 Mediating Effect of Entrepreneurial Ambidexterity dimensions towards Intention to Adopt IoT	**H4a**	*Perception of usefulness* positively influences *exploration propensity* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H4b	*Perception of usefulness* positively influences *exploitation propensity* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H4c	*Perception of ease of use* positively influences *exploration propensity* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H4d	*Perception of ease of use* positively influences *exploitation propensity* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H5a	*Exploration propensity* positively mediates *perception of usefulness* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H5b	*Exploitation propensity* positively mediates *perception of usefulness* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H5c	*Exploration propensity* positively mediates *perception of ease of use* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H5d	*Exploitation propensity* positively mediates *perception of ease of use* towards the intention to adopt IoT amongst small scale farmers in Sabah
	H6a	*Exploration propensity* has positive influence towards intention to adopt IoT amongst small scale farmers in Sabah
	H6b	*Exploitation propensity* has positive influence towards intention to adopt IoT amongst small scale farmers in Sabah

Figure 1. Hypotheses Groups According to Research Objectives

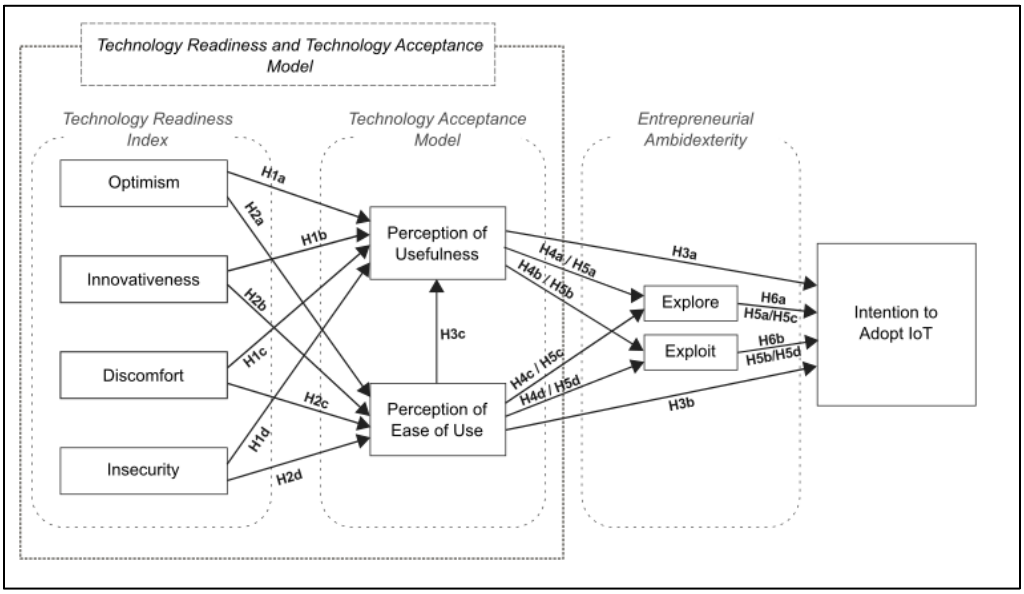

Figure 2. Proposed Research Conceptual Framework

RESEARCH METHOD

Research design and instrument

A cross-sectional quantitative design is applied using survey data from respondents to test the hypotheses on the effects of selected constructs towards IoT adoption intention (Ray, 2020; Wang & Cheng, 2020). Data were gathered using a structured questionnaire using a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), capturing respondents' demographic profiles, including age, gender, education, farming experience, farm size, and current IoT usage. Measurement items were adapted from TRI (Parasuraman, 2000; Parasuraman & Colby, 2015; Walczuch et al., 2007), TAM (Davis, 1989; Venkatesh & Davis, 2000; Walczuch et al., 2007), and entrepreneurial ambidexterity (Gibson & Birkinshaw, 2004; Good & Michel, 2013; He & Wong, 2004; Kauppila & Tempelaar, 2016; March, 1991; Raisch & Birkinshaw, 2008; Raisch et al., 2009; Tushman & O'reilly, 1996) studies as defined in Table 1.

Table 1. Definition of Constructs

Constructs	Definition
Optimism (OPT)	A positive view of IoT and a belief that it offers increased control, flexibility and efficiency in operations.
Innovativeness (INN)	A tendency to be a technology pioneer and leader.
Discomfort (DIS)	A perceived lack of control over IoT and a feeling of being overwhelmed by it.
Insecurity (INS)	Distrust of IoT, scepticism about its ability to work properly and concerns about its potential harmful consequences.
Perception of Usefulness (PoU)	The degree to which a farmer believes that using IoT would enhance farm performance.
Perception of Ease of Use (PEoU)	The degree to which a farmer believes that using IoT required minimal effort to perform a task.
Propensity to Explore (EXP)	Farmer's propensity to innovate, search, experiment, risk-taking, for new variations to solve problems towards farms performance.

Constructs	Definition
Propensity to Exploit (EXPL)	Propensity to conduct activities that include implementation/execution, selection/choice and refinement of existing knowledge for farm performance.
Intention to Adopt IoT (INT)	Farmer's intention to adopt IoT for farm management.

Sampling method

The study's target population comprises agency-registered small-scale farmers in Sabah, primarily cultivating fruits, vegetables, and food crops. Small-scale farmers are defined as smallholders managing farms of 10 acres or less, directly supervised by the farmers or their family members, with annual incomes below RM100,000; in accordance with the Ministry of Agriculture and Food Industries (MAFI) guidelines (KRI, 2024; MAFI, 2021). To ensure representation across Sabah, proportional stratified random sampling (Glasgow, 2005; Lee & Park, 2015; Stephan, 1941) was implemented on administrative divisions. The study relied on land use data in Sabah (MAMPU, 2016) as the proxy indicator for estimating the population's proportion across divisions (Figure 3). The 385 sample size was determined using Cochran's (1977) formula with parameters of 95% confidence level, 5% margin of error, and estimated proportion of population of 0.5 to maximise variability. The sample proportional distribution across identified divisions was calculated relative to non-industrial cultivation land size, as is shown in Figure 3.

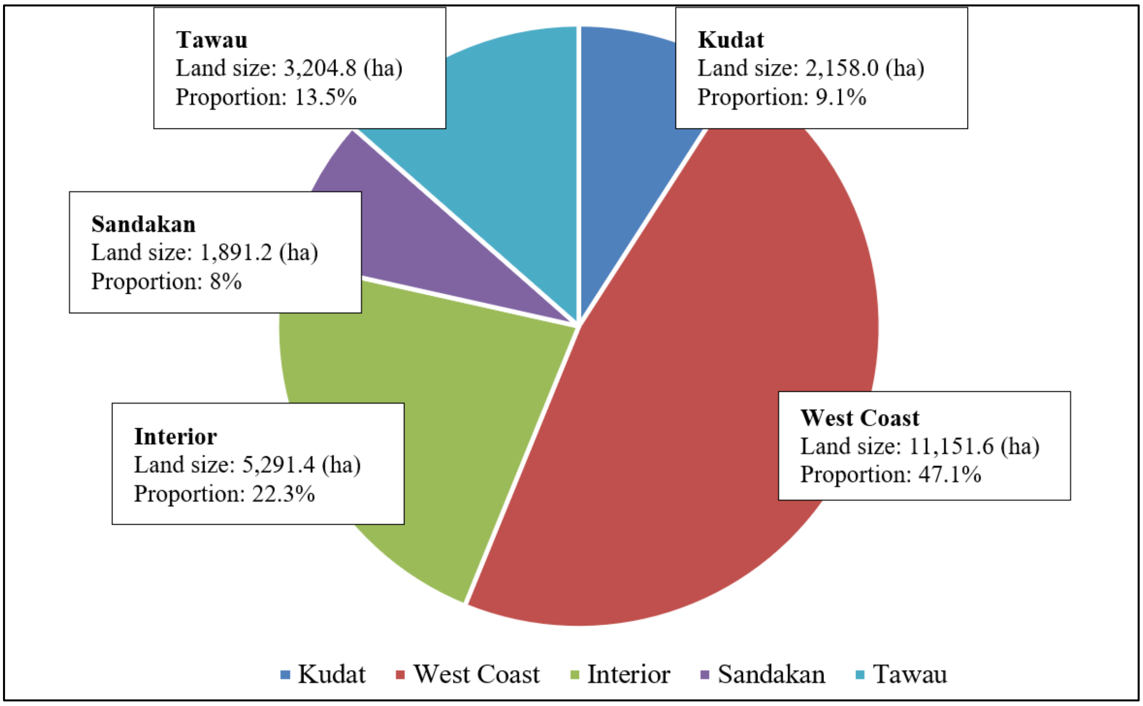

Figure 3. Sample Proportion Based on Land Cultivation Size Data (MAMPU, 2016)

Data collection

Data were collected from April to August 2024 from seminars, meetings, and exhibitions. Before survey administration, respondents were briefed on IoT applications through awareness sessions. 506 total responses were collected, yielding a 76.3% response rate. The remaining data were screened and cleansed, retaining only 385 cases, following the suggested sample proportion for final analysis. Figure 4 illustrates the respondents' demography profile.

PLS-SEM analysis

Constructs' reliability and validity were assessed, guided by the criteria of Hair et al. (2022) and Ramayah et al. (2018). The structural model was evaluated to test hypothesised relationships, with mediation analysis conducted to determine the magnitude of indirect effects. Finally, predictive power analysis was applied to assess model generalisability across different samples.

Several items for measurement were removed due to low loadings, high variance inflation factor (VIF) values, or weak theoretical alignment, to reduce bias. The retained items demonstrated satisfactory loadings with all composite reliability values exceeding 0.7 and average variance extracted values above 0.5, thus meeting recommended thresholds (Hair et al., 2022). Discriminant validity was established, as HTMT values remained below 0.85-0.90 (Henseler et al., 2015; Franke & Sarstedt, 2019; Teo et al., 2008). The results affirmed that the measurement model possesses adequate reliability and validity (Hair et al., 2022; Ringle et al., 2024). Results of both assessments are as indicated in Tables 2 and 3.

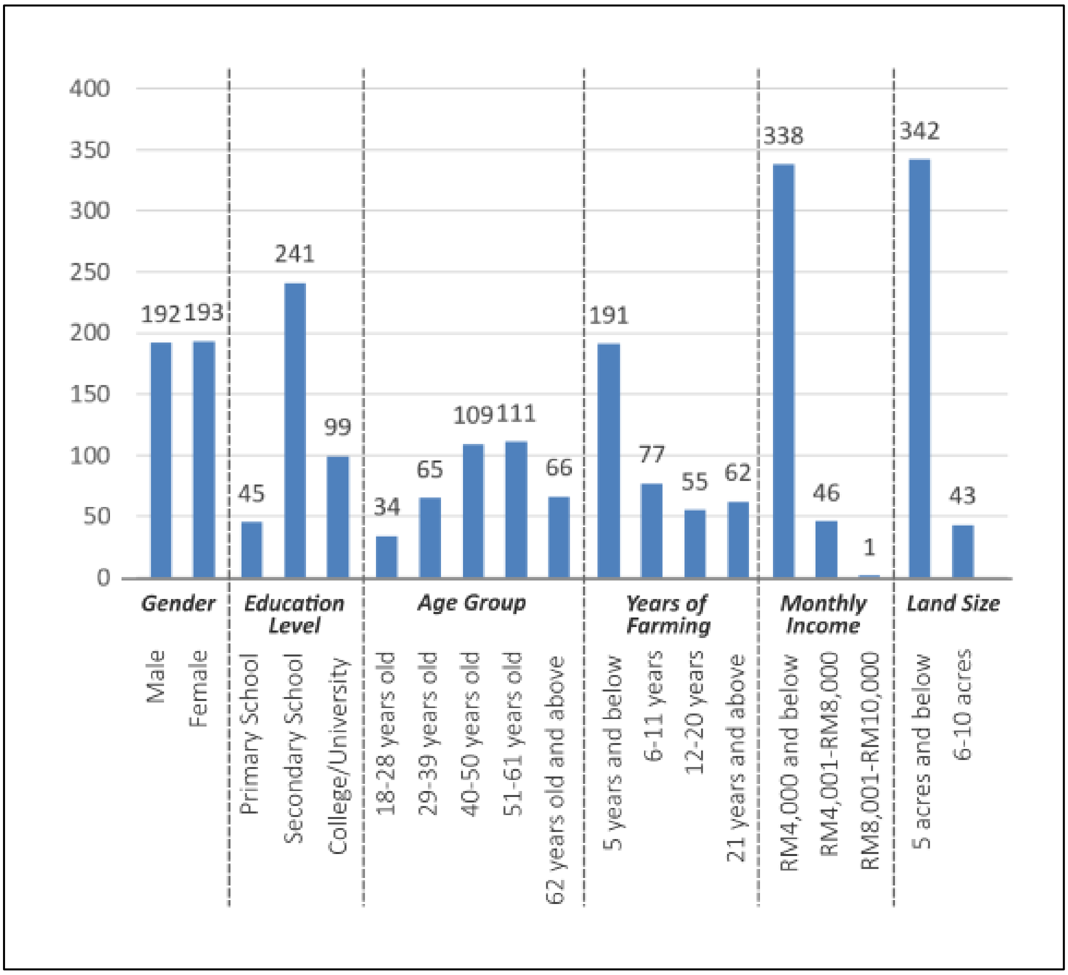

Figure 4. Demography Profile Statistics

Table 2. Reliability and Validity Assessment

Constructs	Items	Loadings	Composite Reliability (CR)	Average Variance Extracted (AVE)
Optimism	OPT1	0.921	0.953	0.870
	OPT3	0.941		
	OPT4	0.937		
Innovativeness	INN1	0.744	0.887	0.665
	INN2	0.876		
	INN3	0.754		
	INN4	0.877		
Discomfort	DIS1	0.872	0.863	0.677
	DIS2	0.776		
	DIS3	0.818		
Insecurity	INS1	0.901	0.888	0.667
	INS2	0.766		
	INS3	0.802		
	INS4	0.790		
Perception of Usefulness	PoU1	0.912	0.945	0.812
	PoU2	0.924		
	PoU3	0.896		
	PoU4	0.871		
Perception of Ease of Use	PEoU2	0.872	0.941	0.800
	PEoU4	0.890		
	PEoU5	0.900		
	PEoU6	0.915		
Explore	EXP1	0.898	0.944	0.770
	EXP2	0.911		
	EXP3	0.893		
	EXP4	0.804		
	EXP5	0.877		
Exploit	EXPL1	0.812	0.935	0.743
	EXPL2	0.884		
	EXPL3	0.903		
	EXPL4	0.811		
	EXPL5	0.895		
Intention to Adopt	INT1	0.871	0.944	0.771
	INT4	0.869		
	INT5	0.892		
	INT6	0.878		
	INT8	0.880		

Table 3. HTMT Matrix of Model

	1	2	3	4	5	6	7	8
1 Optimism								
2 Innovativeness	0.653							
3 Discomfort	0.103	0.195						
4 Insecurity	0.095	0.164	0.746					
5 Perception of Usefulness	0.786	0.623	0.081	0.066				
6 Perception of Ease of Use	0.662	0.673	0.136	0.097	0.706			
7 Exploration	0.607	0.598	0.113	0.103	0.599	0.717		
8 Exploitation	0.575	0.521	0.266	0.294	0.557	0.557	0.713	
9 Intention to Adopt IoT	0.757	0.707	0.077	0.084	0.851	0.641	0.668	0.655

A total of 21 hypotheses derived from the conceptual framework were tested using PLS-SEM and bootstrapping method. Results from the bootstrap algorithm indicated that all VIF values ranged from 1.547 to 2.377, falling within the acceptable threshold (1.0–3.0) - confirming that there was no multicollinearity issue (Becker et al., 2015; Hair et al., 2022). Mediation assessment were conducted by observing the significance of both direct and indirect paths using bootstrapped estimates (5,000 iterations at a 5% significance level), evaluating p-values alongside with bias-corrected confidence intervals (Preacher & Hayes, 2004). Multi-mediation approach (Hair et al., 2014) was used, where total indirect effects of both entrepreneurial ambidexterity constructs were combined and calculated. Finally, variance accounted for (VAF) analysis was conducted to assess the mediation type and magnitude towards IoT adoption intention.

FINDINGS AND DISCUSSION

Results (Table 4) reveal that optimism and innovativeness significantly predicted both perceived usefulness and ease of use, while discomfort and insecurity were non-significant, providing partial support for H1 and H2. Perceived usefulness positively influenced IoT adoption intention, confirming H3a, whereas perceived ease of use had no direct effect, leading to the rejection of H3b. Mediation analysis (Table 5) indicates that entrepreneurial ambidexterity did not significantly mediate the link between perceived usefulness and adoption intention but partially mediated the relationship between perceived ease of use and adoption. Among the ambidexterity dimensions, exploration exerted a stronger mediating effect than exploitation, suggesting that IoT adoption among small-scale farmers is better facilitated when ease of use encourages exploratory behaviours.

Optimism showed the strongest influence on perceived usefulness, while innovativeness had a smaller effect. For perceived ease of use, both innovativeness and demonstrated moderate effects. Within entrepreneurial ambidexterity, perceived ease of use more strongly affected exploration than usefulness, while both acceptance constructs contributed modestly to exploitation. In predicting adoption intention, perceived usefulness emerged as the strongest determinant, followed by exploration and exploitation, with ease of use showing minimal impact. Overall, the model demonstrated moderate to high predictive power (Hair et al., 2014), with adoption intention and perceived usefulness showing the highest R^2 values, and exploitation the lowest, as summarised in Table 6. Summarised results from the structural assessment are as indicated in Figure 5.

Farmers' optimistic outlook tends to view IoT as both valuable and manageable, aligning with prior findings that highlight optimism as a key readiness motivator (Parasuraman, 2000; Lin et al., 2007). Conversely, the non-significance of discomfort and insecurity indicates that motivators outweigh inhibitors (Castiblanco Jimenez et al., 2021; Godoe & Johansen, 2012). Consistent with TAM studies, perceived usefulness was the primary predictor of adoption intention, while ease of use exerted only an indirect effect through usefulness. This reinforces that performance benefits matter more; although intuitive design and experiential training could strengthen usability (Venkatesh, 2000; Gefen et al., 2003). Linking with entrepreneurial ambidexterity, both perceived usefulness and ease of use enhance exploration and exploitation behaviours, with ease of use showing the stronger effect. In resource-constrained settings, effort expectancy triggers ambidextrous engagement (Benner & Tushman, 2003; Jansen et al., 2006; Li et al., 2020; Liu et al., 2025). Exploration mediated adoption through willingness to experiment with IoT applications, while exploitation reinforced adoption by knowing how to apply IoT into existing routines, of which align with ambidexterity theory (March, 1991; Benner & Tushman, 2003), illustrating how exploration drives innovation and exploitation consolidates performance gains from knowledge application.

This study extends TRAM (Lin et al., 2007) into the underexplored context of small-scale farming in Sabah, uncovering distinctive factors contributing towards technology adoption research in agriculture compared with other sectors (Jin, 2019; Kuo et al., 2013; Lestari et al., 2023) in a novel way, with the integration of entrepreneurial ambidexterity (March, 1991). Evidence from Sabahan smallholders shows that commonly assumed predictors, such as ease of use, may not consistently drive adoption due to sociocultural factors (Venkatesh, 2000; Muk & Chung, 2014; Negm, 2023b). The findings also disclose that user-friendly design, training programs, and policy initiatives that encourage experimentation while supporting incremental integration are most effective in solidifying adoptions. Divisional variations in constructs (Figure 6) suggest the need for tailored interventions across regions. These takeaways could guide stakeholders towards designing necessary implementations to enhance IoT technology adoptions.

Table 4. Hypothesis Tests Results

Hypothesis	**β**	**T values**	**P values**	**Decision**
$H1_a$ OPT → PoU	0.602	10.772	0.000	Support
$H1_b$ INN → PoU	0.214	3.953	0.000	Support
$H1_c$ DIS → PoU	-0.024	0.494	0.621	
$H1_d$ INS → PoU	0.013	0.226	0.822	
$H2_a$ OPT → PEoU	0.401	7.462	0.000	Support
$H2_b$ INN → PEoU	0.356	5.162	0.000	Support
$H2_c$ DIS → PEoU	-0.003	0.044	0.965	
$H2_d$ INS → PEoU	0.040	0.729	0.466	
$H3_a$ PoU → INT	0.599	13.038	0.000	Support
$H3_b$ PEoU → INT	-0.002	0.042	0.967	
$H3_c$ PEoU → PoU → INT	0.179	4.952	0.000	Support
$H4_a$ PoU → EXP	0.214	3.162	0.002	Support
$H4_b$ PoU → EXPL	0.317	4.522	0.000	Support

Hypothesis	**β**	**T values**	**P values**	**Decision**
$H4_c$ PEoU → EXP	0.520	8.849	0.000	Support
$H4_d$ PEoU → EXPL	0.309	4.761	0.000	Support
$H5_a$ PoU → EXP → INT	0.034	2.081	0.037	Support
$H5_b$ PoU → EXPL → INT	0.062	2.951	0.003	Support
$H5_c$ PEoU → EXP → INT	0.093	2.938	0.003	Support
$H5_d$ PEoU → EXPL → INT	0.079	3.862	0.000	Support
$H6_a$ EXP → INT	0.159	3.106	0.002	Support
$H6_b$ EXPL → INT	0.196	4.288	0.000	Support

Table 5. Summary of Entrepreneurial Ambidexterity Mediation Effect

Indirect Path	**β**	**Total Effect**	**P Value**	**VAF (%)**		
				Explore	**Exploit**	**Total**
Perception of Usefulness	0.096	0.694	0.000	4.9	8.9	13.8
Perception of Ease of Use	0.172	0.348	0.004	26.7	22.7	49.4

Table 6. Level of Coefficient Determination and PLS-Predict Assessment Results

Construct	**R^{2*}**	**Q^2 Predict**	**Predictive Power**	**RMSE**
Perception of Usefulness	0.606	0.544	Strong	0.679
Perception of Ease of Use	0.463	0.444	Strong	0.751
Propensity to Explore	0.462	0.357	Strong	0.808
Propensity to Exploit	0.325	0.298	Moderate	0.844
Intention to Adopt IoT	0.687	0.538	Strong	0.685

* R2 threshold value – 0.25 weak, 0.50 moderate, 0.75 strong (Hair et al., 2014)

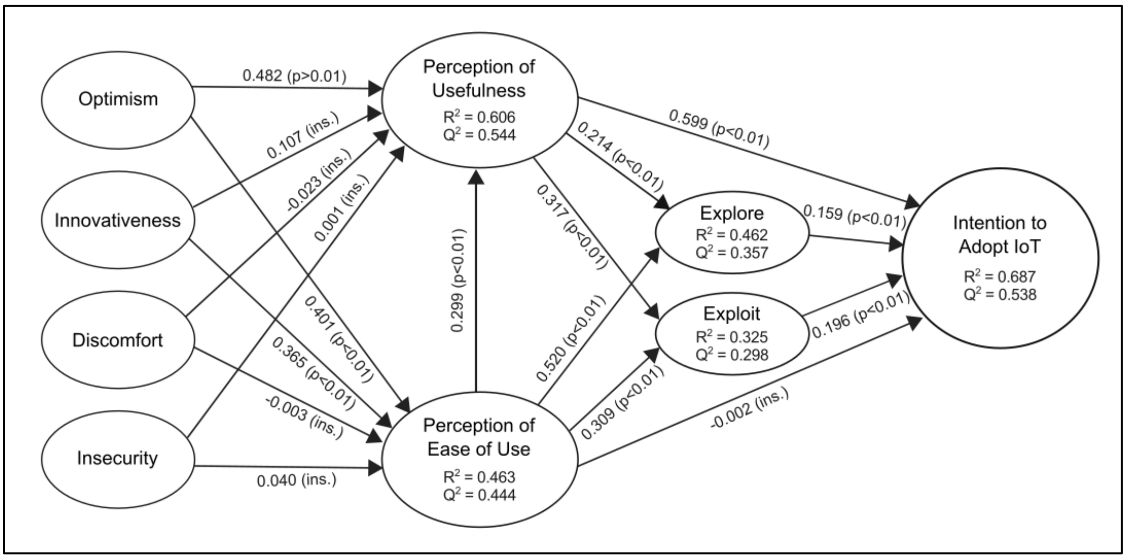

Figure 5. Summary of Results

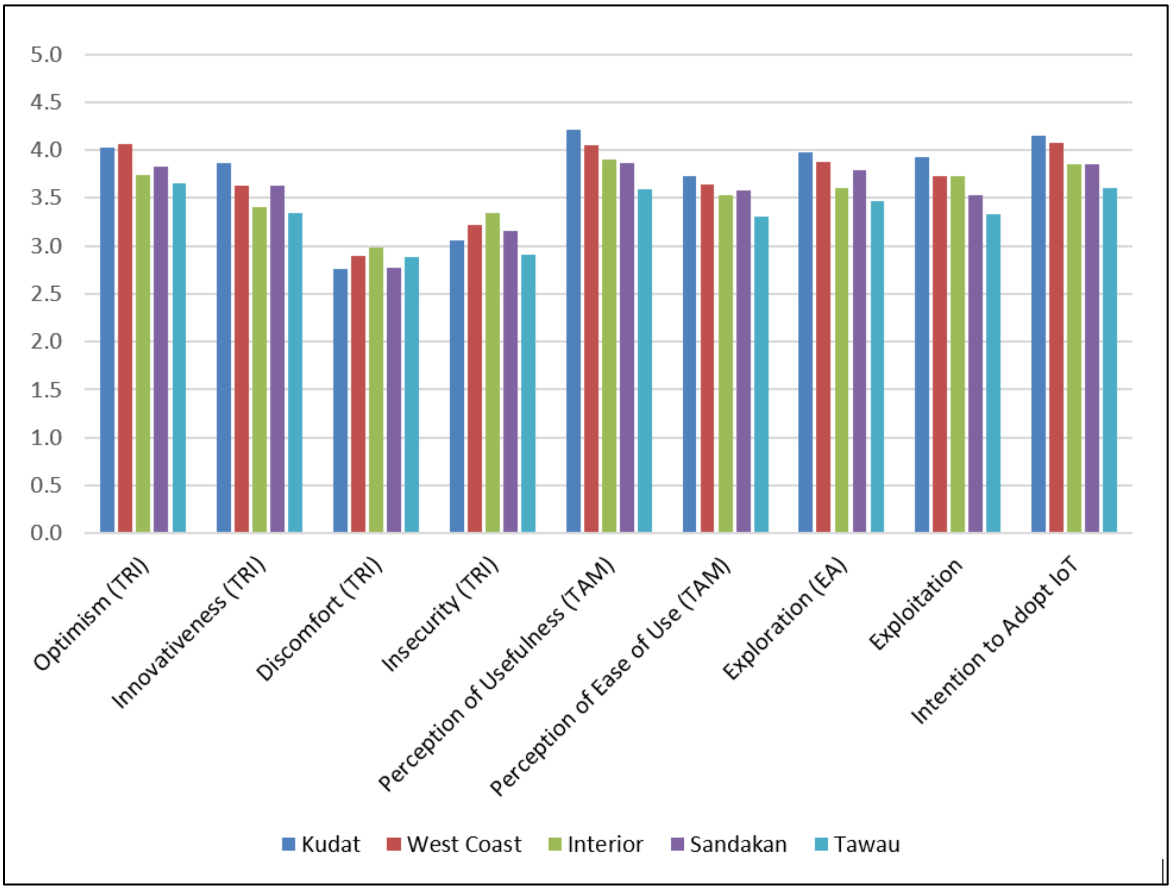

Figure 6. Variable Mean Scores According to Sabah Divisions

CONCLUSIONS AND FURTHER RESEARCH

This study recognises limitations, including linguistic barriers during data collection, oversimplification of technical term, and potential sampling bias due to uneven district representation and limited inclusion of urban farmers. Future research could adopt more inclusive sampling and integrate socio-cultural, behavioural, and demographic factors such as trust, community influence with perceived ease of use into extended models of technology acceptance

(Davis, 1989). Workshop-based IoT exposure and mixed-method approaches could further enrich understanding, while examining financing, training, and sustainability practices would enhance practical insights. Empirically, the findings reveal that technology readiness, particularly optimism and innovativeness, strengthens technology acceptance, with perceived usefulness emerging as the strongest predictor of IoT adoption. Entrepreneurial ambidexterity mediates this relationship, enabling farmers to navigate technological challenges through exploration and exploitation. These results call for the need for targeted, context-sensitive interventions through training, awareness, and infrastructure support. Although adoption barriers persist, coordinated policy efforts, capacity building, and financial incentives could accelerate digital transformation, enhancing productivity, resilience, and sustainability in Sabah's agrofood sector.

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