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Adoption of Digital Accounting Systems among Small and Medium Enterprises in Wetland Ecosystems

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ABSTRACT

Digital accounting systems represent an important component of accounting information systems that support financial recording, reporting, and decision-making in small and medium enterprises (SMEs). However, SMEs operating in environmentally constrained regions may face contextual challenges that alter the determinants of digital accounting adoption. This study examines factors influencing digital accounting system adoption among SMEs in South Kalimantan's wetland ecosystems. Drawing on the Technology Acceptance Model, Diffusion of Innovation Theory, and the Resource-Based View, this research develops an integrated framework to assess the relative influence of perceived usefulness, perceived ease of use, digital infrastructure, and digital literacy on adoption intention. Survey data were collected from 86 SME owners and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that digital literacy ($\beta = 0.439$, $p < 0.001$) is the strongest predictor of adoption intention, followed by perceived usefulness ($\beta = 0.310$, $p = 0.001$) and digital infrastructure ($\beta = 0.233$, $p = 0.004$). Perceived ease of use is not significant ($\beta = 0.092$, $p = 0.435$), suggesting that in chronically volatile environments baseline expectations for technological friction may be elevated, a phenomenon we term friction tolerance. Wetland ecosystem characteristics show no direct or moderating effects. The model explains 72.4% of the variance in adoption intention, indicating strong explanatory power. These findings contribute to accounting information systems literature by demonstrating that capability-based mechanisms, particularly digital literacy, assume greater explanatory weight than perceptual mechanisms in environmentally constrained settings. Practical implications emphasize prioritizing capacity-building initiatives and strategic infrastructure investment to support SME digital accounting adoption in wetland regions.

1. Introduction

The digital transformation of small and medium enterprises (SMEs) has become a strategic priority in developing economies, given its role in enhancing financial transparency, operational efficiency, and access to formal financing (Handayani et al., 2023; Tiwasing et al., 2022). In Indonesia, SMEs contribute approximately 61% to gross domestic product and absorb 97% of the national workforce, underscoring their central role in economic development (Handayani et al., 2023). Digital accounting systems play a critical role in this transformation by enabling more accurate financial reporting and improving decision-making (Musyaffi et al., 2025). However, adoption remains uneven, particularly among SMEs operating in constrained environments where infrastructural limitations intersect with operational challenges (Tiwasing et al., 2022; Morris et al., 2022).

DOI: 10.26618

The Technology Acceptance Model (TAM) has served as the dominant theoretical framework for understanding technology adoption for nearly four decades (Davis, 1989). TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) function as the primary antecedents of behavioral intention. This parsimonious framework has accumulated substantial empirical support across technologies, user populations, and cultural contexts (Legris et al., 2003). Extended through the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) and integrated with Diffusion of Innovation (DOI) theory (Rogers, 2019) the TAM tradition has demonstrated remarkable resilience and adaptability. However, this tradition carries an implicit assumption of contextual neutrality, namely that the psychological mechanisms linking perceptions to intentions operate uniformly across settings, and that context merely moderates rather than fundamentally reconfigures these relationships (Legris et al., 2003).

Recent evidence from developing and resource-constrained contexts challenges this assumption. Rana et al. (2025), studying FinTech adoption in Bangladesh's agricultural sector, found that perceived ease of use was not significant, while perceived usefulness and trust assumed greater explanatory weight. Similarly, studies in other developing economy contexts have reported non-significant effects of perceived ease of use (Rana et al., 2025; Musyaffi et al., 2025). These findings, alongside evidence highlighting the role of digital literacy and infrastructural constraints (Morris et al., 2022; Díaz-Arancibia et al., 2024), suggest a systematic reweighting of adoption determinants under conditions of resource constraint.

These inconsistencies point to a critical theoretical gap. Existing studies document the diminishing role of perceived ease of use but provide limited explanation of the underlying mechanism, implicitly maintaining the assumption that core adoption drivers remain stable across contexts. This study argues that such deviations are not anomalies but reflect context-induced recalibrations in how adoption decisions are formed. In particular, we propose that under conditions of persistent constraint, baseline expectations regarding technological difficulty may be elevated, reducing the discriminating role of effort-related perceptions, a mechanism we term *friction tolerance*.

Wetland ecosystems, such as those found extensively in South Kalimantan, provide a theoretically relevant boundary condition to examine this mechanism. These environments impose persistent operational challenges on SMEs, including infrastructural instability and irregular business cycles (Morris et al., 2022; Tiwasing et al., 2022). Internet connectivity is often unstable, digital devices are exposed to harsh conditions, and business operations follow seasonal patterns (Morris et al., 2022). Under such conditions, the experience of technology use may differ systematically from that assumed in conventional adoption models developed in stable environments, making wetland SMEs a critical context for examining the limits of established adoption theories.

To address this gap, this study develops and tests the ACCORD (Adoption Capability and Contextual Readiness for Digital Accounting) framework, which integrates the Technology Acceptance Model (Davis, 1989), Diffusion of Innovation (Rogers, 2019), and the Resource-Based View (Barney, 1991). Rather than proposing a new grand theory, ACCORD serves as a heuristic framework to assess the relative explanatory roles of perceptual, infrastructural, and capability-based mechanisms under conditions of environmental constraint. Three research questions guide this study: (1) to what extent do perceived usefulness and perceived ease of use influence adoption intention in wetland SMEs; (2) how do digital infrastructure and digital literacy compare to perceptual factors in explaining adoption; and (3) whether wetland ecosystem characteristics function as direct or moderating influences.

DOI: 10.26618

This study contributes to the technology adoption literature in three ways. First, it advances an integrated framework that combines TAM, Diffusion of Innovation, and the Resource-Based View to explain adoption in constrained environments (Abdallah et al., 2024; Seppänen et al., 2025). Second, it provides a theoretical explanation for the inconsistent role of perceived ease of use by introducing *friction tolerance* as an underlying mechanism (Rana et al., 2025). Third, it demonstrates that capability-based factors, particularly digital literacy, may assume greater explanatory importance than perceptual factors in shaping adoption decisions under environmental constraints (Kampoowale et al., 2026; Musyaffi et al., 2025).

2. Literature Review

2.1 Conceptual and Theoretical Foundations

2.1.1 Technology Acceptance Model

The Technology Acceptance Model (TAM), introduced by Davis (1989), has achieved paradigmatic status in information systems research. TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) are the primary determinants of behavioral intention, capturing the extent to which a technology is perceived as beneficial and effortless to use. The strength of TAM lies in its parsimony, reducing adoption decisions to a limited set of cognitive evaluations, and extensive empirical evidence has consistently supported these relationships across technologies and contexts (Legris et al., 2003).

Despite its empirical robustness, TAM has been subject to sustained critique. Bagozzi (2007) argues that the model oversimplifies adoption by neglecting broader psychological and contextual influences. Subsequent extensions, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), incorporate additional factors including social influence and facilitating conditions (Venkatesh et al., 2003). More fundamentally, the TAM tradition carries an implicit assumption of contextual neutrality, namely that the relationships between perceptions and intentions operate uniformly across settings, with context acting primarily as a moderating influence rather than a structural determinant (Legris et al., 2003).

In the context of digital accounting, perceived usefulness reflects beliefs about improved financial reporting accuracy, efficiency, and decision-making, while perceived ease of use captures expectations regarding learnability and operational simplicity (Musyaffi et al., 2025). Under standard TAM logic, both constructs are expected to positively influence adoption intention. However, this expectation presumes that perceptual evaluations remain the dominant drivers of adoption across all environments, an assumption that has been increasingly questioned in recent research.

2.1.2 Diffusion of Innovation: Infrastructure as Enabling Architecture

Diffusion of Innovation (DOI) theory complements TAM by shifting attention from individual perceptions to the broader environmental and structural conditions shaping adoption (Rogers, 2019). DOI emphasizes that adoption is influenced not only by perceived attributes of the technology but also by contextual factors such as communication channels, social systems, and material conditions of use.

Within this perspective, digital infrastructure emerges as a critical enabling condition. Infrastructure encompasses stable internet connectivity, access to digital devices, and institutional support systems that facilitate sustained technology use (Handayani et al., 2023). In emerging economies, infrastructural limitations have been consistently identified as binding constraints on digital transformation. Morris et al. (2022) show that inadequate connectivity and device access restrict rural SMEs' ability to participate in digital economies, while Díaz-Arancibia et al. (2024) highlight the importance of broader entrepreneurial ecosystems in shaping adoption patterns.

DOI: 10.26618

Importantly, infrastructure does not operate independently of perceptions. Rather, the relationship between infrastructure and perceptual factors is often non-linear and non-additive. Weak infrastructure can suppress the influence of positive perceptions, while strong infrastructure can amplify the effects of perceived usefulness (Handayani et al., 2023). This suggests that infrastructural conditions may not only enable adoption but also shape the relative importance of perceptual determinants.

2.1.3 Resource-Based View: Capabilities as Strategic Resources

The Resource-Based View (RBV) (Barney, 1991) provides a complementary perspective by emphasizing the role of firm-specific capabilities in shaping organizational outcomes. Unlike TAM and DOI, which focus on perceptions and external conditions, RBV highlights internal resources as primary drivers of competitive advantage and strategic action.

In the context of technology adoption, digital literacy represents a critical capability. It refers to the ability to understand, operate, troubleshoot, and strategically utilize digital technologies for business purposes (Abdallah et al., 2024). Unlike perceptual factors, which may fluctuate across situations, digital literacy constitutes a relatively stable and transferable resource that enables entrepreneurs to navigate technological complexity even under adverse conditions (Seppänen et al., 2025).

Empirical evidence increasingly supports the centrality of digital literacy in developing economies. Handayani et al. (2023) found that technological capabilities significantly influence accounting technology adoption among Indonesian MSMEs. Similarly, Permatasari et al. (2024) demonstrated that digital literacy and performance expectancy are key drivers of cloud accounting adoption in the Indonesian context. Kampoowale et al. (2026) further show that human capital plays a key role in linking digital transformation to firm performance. These findings suggest that capability-based mechanisms may become particularly salient in contexts where external support is limited.

2.1.4 The Debate on Ease of Use Universality

Although TAM has been widely validated, a growing body of evidence challenges the universal applicability of perceived ease of use as a core determinant of adoption. This emerging debate centers on whether PEOU maintains predictive power across contexts or whether its influence varies systematically under different environmental conditions.

Several studies from developing economies report non-significant effects of perceived ease of use. Rana et al. (2025) find that PEOU does not significantly influence FinTech adoption attitudes in Bangladesh, while perceived usefulness and trust remain significant. Permatasari et al. (2024) observed that effort expectancy showed weaker effects in cloud accounting adoption among Indonesian SMEs, with digital literacy and performance expectancy emerging as dominant predictors. Musyaffi et al. (2025) further demonstrate that the role of ease of use varies across firm characteristics and prior experience. These findings suggest that the predictive power of PEOU is not universal but context-dependent. However, existing studies largely document this inconsistency without providing a clear theoretical explanation. This gap raises a critical question: under what conditions does perceived ease of use lose its explanatory relevance?

This study proposes that environmental constraints may recalibrate baseline expectations of technological difficulty. In contexts characterized by persistent infrastructural instability and operational challenges, all technologies may be perceived as inherently effortful. When difficulty becomes normalized, ease of use may no longer function as a discriminating factor in adoption decisions. We conceptualize this mechanism as *friction tolerance*, defined as a context-induced recalibration of baseline expectations regarding technological effort.

2.1.5 Wetland Ecosystems as a Boundary Condition

Wetland ecosystems provide a theoretically relevant context for examining this mechanism. These environments impose persistent operational constraints on SMEs, including unstable connectivity, limited access to technical support, and irregular business cycles (Morris et al., 2022; Tiwasing et al., 2022). Entrepreneurs in such contexts must navigate these challenges while managing their day-to-day operations.

The role of environmental conditions in technology adoption, however, remains theoretically ambiguous. While some perspectives emphasize infrastructural constraints as significant barriers to adoption (Morris et al., 2022), others highlight the adaptive resilience of rural entrepreneurs, who rely on internal capabilities and social networks to overcome external limitations (Díaz-Arancibia et al., 2024). This tension suggests that environmental factors may not directly determine adoption outcomes but instead function as boundary conditions that reshape the relative importance of perceptual, infrastructural, and capability-based mechanisms.

2.1.6 The ACCORD Framework and Hypotheses Development

Synthesizing these perspectives, TAM, DOI, and RBV imply different primary drivers of adoption: perceptual evaluations, infrastructural conditions, and internal capabilities. In stable environments, these mechanisms are often assumed to operate in parallel. However, in constrained environments, their relative explanatory roles may diverge. The ACCORD (Adoption Capability and Contextual Readiness for Digital Accounting) framework proposes that environmental conditions can systematically reweight these mechanisms, shifting the balance from perception-based toward capability-based drivers.

Within this framework, adoption intention is shaped by three categories of determinants: perceived usefulness and perceived ease of use (TAM), digital infrastructure (DOI), and digital literacy (RBV). The framework further posits that environmental conditions influence not only the strength but also the relative importance of these determinants.

Drawing on TAM, perceived usefulness captures the instrumental value of digital accounting for improving business performance. Even in contexts where other perceptual relationships weaken, perceived usefulness has been shown to remain a stable predictor of adoption (Rana et al., 2025; Permatasari et al., 2024).

TAM also posits that perceived ease of use facilitates adoption by reducing cognitive effort (Davis, 1989). However, consistent evidence from developing contexts suggests that this relationship may weaken or disappear under certain conditions (Rana et al., 2025; Permatasari et al., 2024). Within the ACCORD framework, this attenuation is explained by friction tolerance. In environments characterized by persistent constraints, elevated baseline expectations of difficulty reduce the discriminating role of effort-related perceptions.

From a DOI perspective, digital infrastructure provides the necessary conditions for technology use. While infrastructure alone may not guarantee adoption, its absence can constrain adoption regardless of favorable perceptions (Doyle et al., 2014; Morris et al., 2022).

From an RBV perspective, digital literacy represents a strategic capability enabling effective technology use. In line with the proposed reweighting mechanism, capability-based factors are expected to assume greater importance in constrained environments (Kampoowale et al., 2026; Seppänen et al., 2025).

Finally, given the theoretical ambiguity regarding environmental effects, wetland ecosystem characteristics are treated as

DOI: 10.26618

exploratory boundary conditions. Prior research provides conflicting evidence, suggesting both constraining and adaptive effects (Díaz-Arancibia et al., 2024). Therefore:

RQ1: Do wetland ecosystem characteristics directly influence SMEs' intention to adopt digital accounting systems?

RQ2: Do wetland ecosystem characteristics moderate the relationships between (a) perceived usefulness and adoption intention, and (b) digital infrastructure and adoption intention?

2.2 Review of Empirical Studies

Empirical studies suggest that the determinants of technology adoption vary across contexts. While TAM has received strong empirical support, recent findings indicate that the effect of perceived ease of use is not always significant.

Rana et al. (2025) found that perceived ease of use does not significantly influence FinTech adoption in Bangladesh, while perceived usefulness and trust remain significant predictors. Similarly, Permatasari et al. (2024) reported that effort expectancy has a weaker effect compared to digital literacy in cloud accounting adoption among Indonesian SMEs. Musyaffi et al. (2025) further demonstrate that the role of ease of use varies depending on firm characteristics.

From a DOI perspective, infrastructure constraints have been identified as major barriers to technology adoption, particularly in rural areas (Morris et al., 2022). However, Díaz-Arancibia et al. (2024) highlight that entrepreneurs can adapt through social networks and internal capabilities despite such limitations.

Within the RBV framework, digital literacy consistently emerges as a key determinant of technology adoption (Handayani et al., 2023; Permatasari et al., 2024; Kampoowale et al., 2026). However, most studies examine these factors in isolation, with limited efforts to integrate perceptual, infrastructural, and capability-based perspectives into a unified framework.

2.3 Identification of the Research Gap

Based on the theoretical and empirical review, several research gaps are identified. First, although TAM has been widely applied, inconsistencies in the role of perceived ease of use remain insufficiently explained (Rana et al., 2025; Permatasari et al., 2024). Second, prior studies tend to examine perception, infrastructure, and capability separately, without integrating these perspectives into a comprehensive framework.

Third, limited attention has been given to extreme environmental contexts, such as wetland ecosystems, as boundary conditions in technology adoption. These contexts are characterized by infrastructural instability and operational constraints (Morris et al., 2022; Tiwasing et al., 2022).

Fourth, existing studies lack a clear conceptual explanation of how environmental conditions influence the relevance of perceived ease of use. To address this gap, this study introduces the concept of *friction tolerance*, referring to a context-driven recalibration of baseline expectations regarding technological difficulty.

2.4 Development of the Conceptual Framework

This study proposes the ACCORD (Adoption Capability and Contextual Readiness for Digital Accounting) framework, which integrates TAM, DOI, and RBV. Within this framework, adoption intention is influenced by three main categories:

1. Perceptual factors: perceived usefulness and perceived ease of use (Davis, 1989; Musyaffi et al., 2025)
2. Contextual factors: digital infrastructure (Rogers, 2019; Handayani et al., 2023)
3. Capability factors: digital literacy (Barney, 1991; Abdallah et al., 2024)

The framework emphasizes that environmental conditions not only affect the strength of relationships but also reshape the relative importance of these determinants. In constrained environments, capability-based

DOI: 10.26618

factors are expected to become more dominant than perception-based factors.

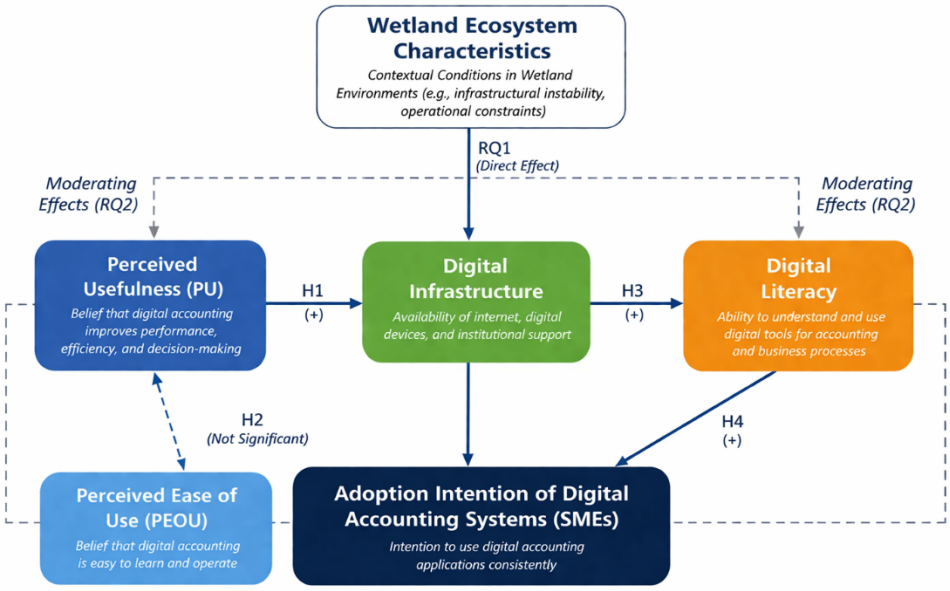

Fig. 1. Conceptual Framework of the Study (ACCORD Framework)

2.5 Hypotheses or Research Propositions

Based on the proposed framework, the hypotheses are formulated as follows:

H1: Perceived usefulness positively influences SMEs' intention to adopt digital accounting systems in wetland ecosystems (Rana et al., 2025; Permatasari et al., 2024).

H2: Perceived ease of use does not significantly influence SMEs' intention to adopt digital accounting systems in wetland ecosystems (Davis, 1989; Rana et al., 2025; Permatasari et al., 2024).

H3: Digital infrastructure positively influences SMEs' intention to adopt digital accounting systems (Doyle et al., 2014; Morris et al., 2022).

H4: Digital literacy positively influences SMEs' intention to adopt digital accounting systems (Kampoowale et al., 2026; Seppänen et al., 2025).

3. Research Methods

3.1 Research Design

This study employs a quantitative explanatory research design to examine the factors influencing digital accounting adoption among SMEs in wetland ecosystems. The approach is appropriate because the study aims to test theoretically derived hypotheses and assess structural relationships among latent constructs.

Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected for three reasons. First, it accommodates complex models with multiple constructs. Second, it is robust to non-normal data and suitable for relatively small samples. Third, it emphasizes prediction of the target construct, adoption intention, aligning with the study's explanatory objectives (Hair et al., 2019).

3.2 Research Context and Setting

The study was conducted in South Kalimantan, Indonesia, a region characterized by extensive wetland ecosystems including river basins, coastal marshlands, and peatlands. These environments present persistent operational challenges, including infrastructural instability and irregular business cycles that directly shape how SMEs operate (Morris et al., 2022; Tiwasing et al., 2022).

Approximately 399,000 SMEs operate in the province, with an estimated 10 percent located in wetland-affected areas. These

DOI: 10.26618

enterprises span fisheries, trade, agriculture, and eco-tourism, where environmental conditions directly shape business operations (Morris et al., 2022). This context provides a relevant setting for examining technology adoption under persistent environmental constraints.

3.3 Population and Sample

The target population comprises SME owners and primary financial record-keepers operating in wetland areas of South Kalimantan. Inclusion criteria required that respondents (1) operate in wetland locations, (2) are responsible for financial records, and (3) have prior awareness of digital accounting applications.

Purposive sampling was employed through cooperative offices and SME networks, yielding 86 valid responses. This approach is appropriate for accessing a specific and difficult-to-reach population and aligns with prior SME research in developing contexts (Handayani et al., 2023). Sample adequacy was assessed using complementary approaches. The 10-times rule indicates a minimum of 50 observations, given five structural paths (Hair et al., 2019). The achieved sample of 86 exceeds this threshold.

A more conservative G*Power analysis suggests a minimum of 92 observations for medium effect size (f^2 = 0.15) and power of 0.80. The achieved sample is slightly below this threshold. This marginal shortfall is mitigated by (1) compliance with the 10-times rule, (2) observed effect sizes comparable to assumed levels, and (3) post-hoc power estimates ranging from 0.82 to 0.97 for significant paths. While the sample is adequate for PLS-SEM analysis, its size and regional focus limit generalizability beyond comparable wetland SME contexts.

The sample consists predominantly of micro-enterprises (78%), operating in fisheries (35%), trade (41%), and agriculture (24%), with a median business age of 6–10 years. Approximately 72% of respondents reported prior use of digital tools, indicating sufficient familiarity to evaluate digital accounting adoption.

3.4 Data Sources and Data Collection

Data were collected through structured questionnaires administered between August and October 2025. Face-to-face administration was used to ensure accessibility and improve response quality, particularly in geographically dispersed areas with varying literacy levels. The instrument comprised two sections: (1) demographic and business characteristics, and (2) measurement items for six constructs. All items were measured using five-point Likert scales.

Content validity was established through expert review involving two accounting academics and one practitioner. Pilot testing with 10 SME owners resulted in minor refinements to improve clarity and contextual relevance.

3.5 Measurement of Variables and Research Instuments

All constructs were operationalized as reflective measures adapted from prior validated studies (Hair et al., 2019). Perceived usefulness and perceived ease of use were adapted from Davis (1989) and Musyaffi et al. (2025). Digital infrastructure was adapted from Doyle et al. (2014) and Shbeilat and Al-Hajaia (2022). Digital literacy was adapted from Abdallah et al. (2024). Wetland ecosystem characteristics were adapted from Morris et al. (2022). Adoption intention was adapted from Davis (1989) and Permatasari et al. (2024).

One indicator of wetland ecosystem characteristics (KE3) was removed due to low loading (<0.70). The refined construct retained acceptable reliability and validity, and its exclusion did not affect substantive conclusions.

3.6 Data Analysis Techniques

Data were analyzed using SmartPLS 4 following a two-stage approach (Hair et al., 2019). The measurement model was evaluated in terms of indicator reliability (loadings >

DOI: 10.26618

0.70), internal consistency (CR > 0.70), convergent validity (AVE > 0.50), and discriminant validity using the Fornell-Larcker criterion and HTMT (<0.90) (Henseler et al., 2015). The structural model was assessed using bootstrapping (5,000 resamples) to estimate path coefficients, t-values, and p-values. Model explanatory power was evaluated using R^2, predictive relevance using Q^2, and effect sizes using f^2.

Several additional tests were conducted to enhance methodological rigor. Alternative model specifications were examined to assess potential reverse causality, yielding consistent results. Unobserved heterogeneity was tested using finite mixture segmentation, indicating no meaningful subgroup variation. Common method bias was assessed using Harman's single-factor test and a marker variable approach, both indicating no serious bias. Additional robustness checks, including alternative bootstrapping specifications and jackknife procedures, confirmed the stability of the results.

3.7 Validity, Reliability, and Trustworthiness

Content validity was ensured through expert review and pilot testing. Construct validity and reliability were confirmed through measurement model evaluation, with all constructs meeting established thresholds (Hair et al., 2019). Discriminant validity was supported by both Fornell-Larcker and HTMT criteria.

3.8 Ethical Considerations

Participation was voluntary, and respondents were informed of the study purpose prior to data collection. Verbal informed consent was obtained, and no personal identifiers were recorded. Data were stored securely and used solely for academic purposes. Ethical approval was obtained from the institutional review board.

3.9 Research Procedure

The research was conducted through several structured stages. First, the conceptual framework and hypotheses were developed based on theoretical and empirical literature. Second, the research instrument was designed and validated through expert review and pilot testing. Third, data were collected through face-to-face surveys. Fourth, the collected data were screened and prepared for analysis. Finally, data were analyzed using PLS-SEM to test the measurement and structural models and to evaluate the research hypotheses.

3.10 Methodological Limitations

This study has several limitations. First, the relatively small sample size and its concentration in a specific region may limit the generalizability of the findings beyond similar wetland SME contexts. Second, the use of cross-sectional data restricts the ability to capture dynamic changes in technology adoption over time. Third, although common method bias was tested and found to be insignificant, the use of self-reported data may still introduce potential bias. These limitations provide opportunities for future research to employ larger samples, longitudinal designs, and multi-source data.

4. Results and Discussion

4.1 Research Results

4.1.1 Sample Description and Descriptive Statistics

The final sample consists of 86 SMEs operating in wetland areas of South Kalimantan. The sample is dominated by micro-enterprises (78%), with business sectors including fisheries (35%), trade (41%), and agriculture (24%). The majority of businesses have been operating for 6–10 years, indicating moderate business maturity. Additionally, approximately 72% of respondents reported prior use of digital tools, suggesting sufficient familiarity with technology adoption.

DOI: 10.26618

4.1.2 Data Quality and Preliminary Analysis

Prior to hypothesis testing, data quality and measurement properties were assessed. The measurement model was evaluated to establish reliability and validity of the constructs. Table 1 presents the results.

Table 1. Measurement Model Assessment

Construct	Indicator	Loading	CR	AVE	Cronbach's α
Perceived Usefulness (PU)	PU1	0.912	0.937	0.832	0.899
	PU2	0.947			
	PU3	0.877			
Perceived Ease of Use (PEOU)	PEOU1	0.844	0.891	0.732	0.816
	PEOU2	0.872			
	PEOU3	0.853			
Digital Infrastructure (ID)	ID1	0.799	0.814	0.594	0.674
	ID2	0.778			
	ID3	0.737			
Digital Literacy (LD)	LD1	0.914	0.950	0.865	0.922
	LD2	0.939			
	LD3	0.938			
Wetland Ecosystem (KE)	KE1	0.784	**0.814**	**0.594**	**0.674**
	KE2	0.736			
Intention to Adopt (INT)	INT1	0.911	0.934	0.825	0.894
	INT2	0.918			
	INT3	0.897			

Source: Data processed, 2026

After removing KE3 due to low loading (0.362), the wetland ecosystem characteristics (KE) construct, comprising two indicators (KE1 and KE2), demonstrated acceptable psychometric properties. The retained indicators exhibited loadings of 0.784 and 0.736, with composite reliability of 0.814 and average variance extracted of 0.594, both exceeding recommended thresholds (Hair et al., 2019). All other constructs demonstrated excellent psychometric properties: indicator loadings ranged from 0.737 to 0.947, exceeding the 0.70 threshold; composite reliability values ranged from 0.814 to 0.950, above the 0.70 benchmark; and average variance extracted ranged from 0.594 to 0.865, exceeding the 0.50 minimum.

DOI: 10.26618

Discriminant validity was assessed using the Fornell-Larcker criterion. The square root of AVE for each construct (ranging from 0.771 to 0.985) exceeded its highest correlation with any other construct, confirming that all constructs are empirically distinct

4.1.3 Main Analytical Results

Following measurement model validation, the structural model was evaluated. Table 2 presents the structural model results.

Table 2. Structural Model Results

Hypothesis	Path	Coefficient (β)	t-value	p-value	f^2	Support
H1	PU → INT	0.310	3.311	0.001	0.08	Supported
H2	PEOU → INT	0.092	0.782	0.435	0.01	Not Supported
H3	ID → INT	0.233	2.866	0.004	0.05	Supported
H4	LD → INT	0.439	3.944	<0.001	0.16	Supported

Source: Data processed, 2026

The model explains a substantial portion of the variance in adoption intention, with an R^2 value of 0.724. This indicates that the ACCORD framework accounts for 72.4% of the variance in SMEs' intention to adopt digital accounting systems in wetland ecosystems, strong explanatory power by conventional standards in technology adoption research (Hair et al., 2019). The adjusted R^2 of 0.718 confirms the model's robustness. Stone-Geisser's Q^2 of 0.452 confirms predictive relevance.

The pattern of results reveals significant asymmetry in the influence of adoption determinants. Digital literacy (LD) emerges as the dominant predictor (β = 0.439, p < 0.001, f^2 = 0.16), followed by perceived usefulness (PU) (β = 0.310, p = 0.001, f^2 = 0.08) and digital infrastructure (ID) (β = 0.233, p = 0.004, f^2 = 0.05). In contrast, perceived ease of use (PEOU) exerts no significant effect (β = 0.092, p = 0.435, f^2 = 0.01). H1, H3, and H4 are supported; H2 is not supported.

4.1.4 Hypothesis Testing Results

The hypothesis testing results are summarized as follows:

- H1 is supported: perceived usefulness significantly influences adoption intention (β = 0.310, p = 0.001).
- H2 is not supported: perceived ease of use does not significantly influence adoption intention (β = 0.092, p = 0.435).
- H3 is supported: digital infrastructure significantly influences adoption intention (β = 0.233, p = 0.004).
- H4 is supported: digital literacy significantly influences adoption intention (β = 0.439, p < 0.001).

Among the predictors, digital literacy shows the largest effect size (f^2 = 0.16), followed by perceived usefulness (f^2 = 0.08) and digital infrastructure (f^2 = 0.05), while perceived ease of use has a negligible effect (f^2 = 0.01). Table 3 presents the results for the exploratory research questions concerning wetland ecosystem characteristics.

DOI: 10.26618

Table 3. Direct and Moderating Effects of Wetland Ecosystem Characteristics

Relationship	Coefficient (β)	t-value	p-value
KE → INT (direct)	0.012	0.076	0.939
PU × KE → INT	-0.014	0.063	0.950
ID × KE → INT	-0.019	0.145	0.885

Source: Data processed, 2026

The direct effect of wetland ecosystem characteristics on adoption intention is negligible and non-significant (β = 0.012, p = 0.939). Neither moderation hypothesis receives support: the interaction of KE with perceived usefulness (β = -0.014, p = 0.950) and with digital infrastructure (β = -0.019, p = 0.885) are both non-significant. Thus, RQ1 and RQ2 are answered in the negative: wetland ecosystem characteristics exert no direct or moderating influence on adoption intention in this sample.

4.1.5 Visual Presentation of Results

The empirical results are summarized in Tables 1–3 to enhance clarity and readability. Each table provides a structured representation of descriptive statistics, measurement model evaluation, and hypothesis testing outcomes.

4.2 Research Discussion

4.2.1 Interpretation of Key Findings

The findings reveal a consistent pattern in how SMEs in wetland ecosystems evaluate digital accounting adoption. Three determinants significantly influence adoption intention: digital literacy, perceived usefulness, and digital infrastructure. In contrast, perceived ease of use exerts no significant effect, and wetland ecosystem characteristics show neither direct nor moderating influence.

The Dominance of Digital Literacy. Digital literacy emerges as the strongest predictor (β = 0.439, p < 0.001, f^2 = 0.16), indicating that internal capabilities become particularly consequential when external conditions are volatile and support systems unreliable. Entrepreneurs with higher digital literacy can troubleshoot difficulties, adapt to intermittent connectivity, and utilize digital tools without relying heavily on external support. This capability functions as a portable strategic resource, reinforcing the Resource-Based View's emphasis on internal resources as key drivers of action (Barney, 1991). This finding extends prior evidence by demonstrating that capability-based mechanisms may dominate adoption decisions under environmental constraints, consistent with Seppänen et al. (2025).

The Enduring Role of Perceived Usefulness. Perceived usefulness remains a significant predictor (β = 0.310, p = 0.001, f^2 = 0.08), indicating that tangible performance gains, such as improved reporting accuracy, faster financial recording, and enhanced decision-making, continue to motivate adoption even in constrained environments. This finding is consistent with TAM's core proposition that instrumental value drives adoption (Davis, 1989) and extends recent evidence from Indonesian SMEs (Handayani et al., 2023; Permatasari et al., 2024). Importantly, it suggests that while some perceptual mechanisms weaken, usefulness retains its explanatory power across contexts (Rana et al., 2025).

The Non-Significance of Perceived Ease of Use. The non-significance of perceived ease of use (β = 0.092, p = 0.435) directly informs the ongoing debate on the universality of ease-of-use effects. In canonical TAM, PEOU typically exerts both direct and indirect effects on

DOI: 10.26618

intention, with meta-analytic evidence reporting moderate effect sizes (Legris et al., 2003). In contrast, the present finding indicates that PEOU may lose predictive relevance under certain contextual conditions. This pattern is not isolated but extends evidence from developing contexts where PEOU is frequently non-significant (Rana et al., 2025; Permatasari et al., 2024).

This study explains this pattern through the concept of *friction tolerance*, defined as a context-induced recalibration of baseline expectations regarding technological difficulty. In wetland environments characterized by persistent disruptions, flooding, unstable connectivity, and equipment degradation (Morris et al., 2022), entrepreneurs develop elevated baseline expectations of difficulty. As a result, perceived difficulty becomes normalized and loses its discriminating power in adoption decisions. This mechanism is consistent with adaptation processes documented in resource-constrained entrepreneurship (Reddy & Mamabolo, 2023). Rather than contradicting TAM, this finding indicates that the predictive role of perceived ease of use is context-dependent and may diminish when technological friction is persistently normalized.

The Role of Digital Infrastructure. Digital infrastructure exerts a significant but comparatively weaker effect ($\beta = 0.233$, $p = 0.004$, $f^2 = 0.05$), suggesting that it functions as an enabling condition rather than a primary driver. While infrastructure facilitates adoption, its absence can be partially offset by strong internal capabilities. Entrepreneurs with high digital literacy can develop workarounds for infrastructural limitations, whereas those with low literacy remain constrained even when infrastructure is available. This finding refines DOI's emphasis on infrastructure by demonstrating its contingent role and highlights the interaction between external conditions and internal capabilities (Morris et al., 2022; Handayani et al., 2023).

The Non-Significance of Wetland Ecosystem Characteristics. The non-significance of wetland ecosystem characteristics ($\beta = 0.012$, $p = 0.939$) challenges assumptions that environmental adversity directly suppresses adoption. Instead, it suggests that chronic environmental conditions are incorporated into baseline expectations and no longer function as salient decision factors. This interpretation extends research on adaptive resilience among rural entrepreneurs (Díaz-Arancibia et al., 2024) and indicates that SMEs actively adjust to environmental constraints. The absence of moderating effects further supports the view that environmental conditions function as boundary conditions that reconfigure the relative importance of determinants rather than exerting direct or interaction effects.

4.2.2 Comparison with Previous Studies

Digital Literacy. The dominant effect of digital literacy is consistent with prior studies on SME digitalization. Handayani et al. (2023) found that technological capabilities significantly influence accounting technology adoption among Indonesian MSMEs. Permatasari et al. (2024) further demonstrated that digital literacy and performance expectancy are key drivers of cloud accounting adoption. Kampoowale et al. (2026) further show that human capital mediates digital transformation outcomes. Internationally, Abdallah et al. (2024) provide related evidence that capability-based factors condition the effectiveness of technological access. Collectively, these findings reinforce the centrality of internal capabilities in shaping adoption.

Perceived Usefulness. The positive effect of perceived usefulness is consistent with established TAM findings (Davis, 1989) and extends recent empirical evidence in digital accounting contexts (Musyaffi et al., 2025; Permatasari et al., 2024). Notably, its stability across diverse contexts, from Indonesia to Bangladesh and China (Rana et al., 2025), suggests that instrumental motivation is less

DOI: 10.26618

sensitive to contextual variation than effort-related perceptions.

Perceived Ease of Use. The non-significance of perceived ease of use diverges from canonical TAM expectations but aligns with emerging empirical patterns. Studies in Bangladesh (Rana et al., 2025) and Indonesia (Permatasari et al., 2024; Musyaffi et al., 2025) consistently report weakened or insignificant PEOU effects. This study extends this literature by providing a theoretical mechanism, friction tolerance, that explains why such attenuation occurs under persistent environmental constraints.

Digital Infrastructure and Ecosystem Characteristics. The moderate effect of digital infrastructure is consistent with findings that emphasize infrastructure as a necessary but insufficient condition (Morris et al., 2022; Seppänen et al., 2025). The non-significance of ecosystem characteristics contrasts with assumptions that environmental adversity directly suppresses adoption but aligns with studies emphasizing adaptive resilience among rural entrepreneurs (Díaz-Arancibia et al., 2024). This suggests that environmental factors shape the context of adoption without directly determining outcomes.

4.2.3 Theoretical Contributions

This study advances technology adoption literature in three ways. First, it develops and empirically supports the ACCORD framework, demonstrating that adoption determinants are not fixed but may be systematically reweighted under environmental constraints. Specifically, capability-based mechanisms may assume greater explanatory importance than perceptual mechanisms in such contexts. Second, it contributes to the debate on ease-of-use universality by introducing *friction tolerance* as a theoretical mechanism. This concept explains why perceived ease of use may lose predictive relevance when baseline expectations of technological difficulty are persistently elevated, thereby specifying boundary conditions for TAM.

Third, it extends the Resource-Based View to adoption decisions by demonstrating that digital literacy functions as a strategic resource enabling firms to navigate technological complexity under constrained conditions (Kampoowale et al., 2026; Seppänen et al., 2025).

4.2.4 Practical and Policy Implications

The findings yield several implications.

First, capacity-building initiatives should be prioritized. Training programs should emphasize applied digital skills, including financial data entry, report interpretation, and troubleshooting, tailored to SME operational realities. Second, infrastructure development should be integrated with capability-building efforts. Infrastructure alone is insufficient; complementary investments in digital literacy are required to ensure effective utilization.

Third, outreach strategies should emphasize tangible performance benefits. Demonstrating improvements in efficiency, transparency, and decision-making is likely more persuasive than emphasizing ease of use. Fourth, policymakers should recognize SMEs' adaptive capacity. Rather than treating environmental constraints solely as barriers, interventions should leverage local adaptive practices and contextual knowledge.

4.2.5 Integration with the Research Gap

This study addresses two key gaps: limited research on wetland SMEs and the unresolved debate on ease-of-use universality. The findings demonstrate that adoption mechanisms are context-dependent, provide a theoretical explanation for the diminishing role of perceived ease of use, and show that integrating TAM, DOI, and RBV offers a more comprehensive analytical lens than single-theory approaches.

4.2.6 Acknowledgement of Study Limitations

Several limitations should be noted. The sample size (n = 86), while adequate for PLS-SEM, limits generalizability beyond similar

DOI: 10.26618

contexts. The cross-sectional design captures intention rather than behavior and does not reflect longitudinal dynamics. The measurement of wetland ecosystem characteristics requires further refinement, and friction tolerance was not directly measured. Future research should employ larger and multi-regional samples, longitudinal designs, improved contextual measures, and direct operationalization of friction tolerance. Mixed-method approaches may further illuminate the underlying adaptation processes.

5. Conclusion

5.1 Summary of Key Findings

This study develops and tests the ACCORD framework to examine digital accounting adoption among SMEs in wetland ecosystems. The findings reveal a systematic reweighting of adoption mechanisms under environmental constraints, where capability-based factors, particularly digital literacy, emerge as the dominant drivers, followed by perceived usefulness and digital infrastructure, while perceived ease of use becomes non-significant.

This pattern indicates that adoption decisions in constrained environments are not primarily driven by ease-related perceptions but by the ability of entrepreneurs to navigate persistent operational challenges. Digital literacy functions as a strategic resource that enables SMEs to overcome infrastructural instability, reinforcing the Resource-Based View (Barney, 1991). Perceived usefulness remains relevant, consistent with TAM's emphasis on instrumental value (Davis, 1989), while digital infrastructure serves as an enabling condition rather than a primary determinant (Morris et al., 2022).

The non-significance of perceived ease of use is explained through the concept of *friction tolerance*, defined as a context-induced recalibration of baseline expectations regarding technological difficulty (Reddy & Mamabolo, 2023). Under persistent environmental constraints (Morris et al., 2022), technological difficulty becomes normalized and loses its discriminating role in adoption decisions. Similarly, the absence of direct or moderating effects of wetland ecosystem characteristics suggests that environmental conditions operate as boundary conditions that reshape decision-making processes rather than acting as direct drivers (Díaz-Arancibia et al., 2024).

Taken together, these findings indicate that technology adoption models developed in stable, resource-rich settings may not transfer directly to environmentally constrained contexts without accounting for how chronic constraints recalibrate decision-making mechanisms.

5.2 Theoretical Contributions

This study advances technology adoption literature in three interconnected ways. First, it develops and empirically supports the ACCORD framework, which integrates TAM, Diffusion of Innovation, and the Resource-Based View to explain adoption under environmental constraints. The findings demonstrate that adoption determinants are not fixed but may be systematically reweighted by contextual conditions. This challenges the implicit assumption of contextual neutrality in prior research (Legris et al., 2003) and suggests that adoption mechanisms operate differently across environments.

Second, the study contributes to the debate on ease-of-use universality by providing a theoretical explanation for the diminishing role of perceived ease of use. The concept of *friction tolerance* offers a mechanism linking environmental constraints to changes in perceptual relevance, extending TAM by specifying boundary conditions under which one of its core constructs loses predictive power. This contribution is particularly relevant given accumulating evidence of inconsistent PEOU effects across developing contexts (Rana et al., 2025; Permatasari et al., 2024).

Third, the study extends the Resource-Based View to technology adoption decisions

DOI: 10.26618

by demonstrating that digital literacy functions as a strategic resource enabling firms to operate under persistent constraints (Kampoowale et al., 2026; Seppänen et al., 2025). This finding implies that capability-based mechanisms may assume greater explanatory importance than perceptual mechanisms when external support is limited.

Collectively, these contributions suggest that technology adoption theories developed in stable contexts require explicit consideration of contextual boundary conditions. This insight has broader relevance for global research on digital transformation, particularly in developing economies where environmental volatility and resource constraints are common rather than exceptional.

5.3 Practical and Policy Implications

The findings provide several implications for policymakers and practitioners. First, capacity-building initiatives should be prioritized. The dominant effect of digital literacy indicates that investments in human capital may yield greater impact than standalone technological interventions (Handayani et al., 2023; Permatasari et al., 2024). Training programs should focus on applied competencies, including financial data management and problem-solving in constrained environments.

Second, infrastructure development should be integrated with capability-building efforts. While digital infrastructure remains important, its effectiveness depends on the presence of complementary capabilities (Morris et al., 2022). Integrated interventions that combine connectivity provision with digital literacy training are likely to produce stronger outcomes.

Third, technology outreach strategies should emphasize tangible performance benefits rather than ease of use. The robustness of perceived usefulness suggests that SMEs are more responsive to demonstrated value, such as improved efficiency and decision-making, than to claims of simplicity.

Fourth, policymakers should recognize and leverage SMEs' adaptive capacity. The non-significance of environmental characteristics indicates that entrepreneurs actively adjust to constraints rather than being passively limited by them (Díaz-Arancibia et al., 2024). Policy interventions should therefore be context-sensitive and participatory.

These implications extend beyond wetland ecosystems to other resource-constrained environments, including remote rural areas and regions with limited infrastructure.

5.4 Limitations of the Study

Several limitations provide directions for future research. First, the sample size and regional focus limit generalizability beyond comparable contexts. Future studies should employ larger and multi-regional samples across different environmental settings.

Second, the cross-sectional design captures adoption intention rather than actual behavior. Longitudinal research is needed to examine how adoption evolves over time.

Third, the measurement of wetland ecosystem characteristics requires further refinement, as one indicator was removed due to low loading. Future research should develop more context-sensitive measures.

Fourth, the concept of friction tolerance was not directly measured. Future studies should operationalize and test this construct, including its potential mediating role.

Fifth, comparative studies across different types of environmental constraints may clarify the conditions under which adoption mechanisms are reconfigured.

4.2 Directions for Future Research

This study demonstrates that technology adoption under environmental constraints operates through mechanisms that differ from those observed in more stable settings. The ACCORD framework highlights that capability-based factors, particularly

DOI: 10.26618

digital literacy, assume greater importance than perception-based factors when external conditions are volatile.

Building on these findings, the concept of friction tolerance offers a theoretical explanation for the diminishing relevance of perceived ease of use under persistent constraints. This insight underscores the importance of contextualizing technology adoption theories. Rather than treating context merely as a moderating variable, this study shows that contextual conditions can fundamentally reshape the relative importance of adoption determinants.

Accordingly, future research should further investigate how different types of environmental constraints influence the reconfiguration of adoption mechanisms across contexts. Comparative studies across regions, sectors, and levels of infrastructural development would be particularly valuable in validating the generalizability of the ACCORD framework. In addition, future studies are encouraged to operationalize and empirically test the concept of friction tolerance to strengthen its theoretical and empirical robustness.

For global research and practice, these findings suggest that effective digital transformation strategies must move beyond universal adoption models and instead account for the realities of constrained environments. In such contexts, the ability to adapt and develop internal capabilities becomes more critical than the simplicity of the technology itself.

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