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Determinants of Digital Adoption among Micro and Small Enterprises in Developing Economies: Evidenced from the Afar region, Ethiopia

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ABSTRACT

This study investigates the determinants of digital adoption among micro and small enterprises under increasing digital transformation pressures in developing economies. Unlike previous studies that mainly focus on infrastructure and access, this research integrates social diffusion, firm capabilities, institutional conditions, behavioral factors, and cost barriers into a unified analytical framework. Using an explanatory quantitative research design, primary data were collected from 317 MSE operators and analyzed through a binary probit model to estimate the likelihood of digital adoption. The findings reveal significant nonlinear peer effects, indicating that adoption accelerates only after a critical threshold of users is reached. Algorithmic literacy significantly improves firms' readiness to adopt digital technologies, while customer digital pressure and ecosystem reliability positively influence adoption decisions. In contrast, high internet costs and perceived digital risks significantly hinder adoption. The analysis further demonstrates that digital bricolage enables resource-constrained firms to creatively adapt available resources to support digital transformation. The study contributes to the literature by providing empirical evidence from a developing economy context and by extending understanding of how behavioral and ecosystem-related factors jointly shape digital adoption among MSEs. The findings offer practical implications for policymakers and development agencies to enhance digital skills, improve digital infrastructure, reduce connectivity costs, strengthen institutional trust, and promote network-based digital diffusion strategies.

INTRODUCTION

Digital adoption has become a central driver of competitiveness, productivity, and survival in today's rapid evolving business environment (Amri *et al.*, 2025; Kaewkumpol *et al.*, 2025; Mishrif & Khan, 2023). For micro and small enterprises (MSEs), digital technologies are no longer optional tools but strategic enablers that determine market visibility, operational efficiency, and customer reach (Ruzi *et al.*, 2024; Yani *et al.*, 2025). Increasingly platform-based economies, firms that efficiently integrate digital tools gain faster access to information, reduce transaction costs, and improve responsiveness to market changes (Yufriadi *et al.*, 2024). As result, digital adoption is how widely recognized as critical determinants of business resilience and long-term sustainability specifically for small business enterprises (Chavarnakul *et al.*, 2025; Sudirman *et al.*, 2025).

Competitive environments increasingly generate strong imitation pressure that influence firms' behavior where the digitalization becomes a baseline requirement for survival (Knudsen *et al.*, 2021; Mithas *et al.*, 2013; Su *al.*, 2022). In such contexts, firms often adopt digital technologies not because of internal readiness not due to fear of losing legitimacy and market position relative to competitors (Nugroho, 2025; Su *al.*, 2022; Witschel *et al.*, 2019). At the same time customer expectations have

shifted significantly as digital interaction becomes the dominant mode of transaction, forcing firms to respond to rising demand for speed, accessibility, and transparency (Nugroho, 2015; Yufriadi *et al.*, 2024).

The importance of digital adoption for MSEs lies in its multidimensional effect on their performance (Miniesy *et al.*, 2022; Nurachmad *et al.*, 2025; Raj *et al.*, 2025). It enhances market access by connecting firms to broader customer bases beyond geographical limitation (Juita *et al.*, 2026). It enhances financial inclusion through digital payment systems, and strengthens operational efficiency through automation and data driven decision making (Bello, 2024; Mavlutova *et al.*, 2022). Moreover, digital tools enable small firms to complete with enterprises reducing traditional scale disadvantage and create innovation opportunities (Bhuiyan *et al.*, 2024; Hull *et al.*, 2007).

Despite its importance, digital adoption is shaped by a complex set of determinants that extend beyond simple access to technology. Prior researches identify an external environmental pressure such as competitive imitation, customer demand, and institutional influence as major drivers of adoption decisions (Arroyabe *et al.*, 2024; Lin *et al.*, 2020; Shahadat *et al.*, 2023). Internal organizational capabilities also play a critical role, particularly firms' ability to adapt, equipment, and creatively use limited

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resources in implementing digital solutions (Arroyabe *et al.*, 2024; Atobishi *et al.*, 2024). In addition, cognitive and behavioral factors such as perceived risk, trust in digital systems and managerial digital competence significantly influence adoption of willingness (Khan *et al.*, 2023; Zaman *et al.*, 2025). Furthermore, infrastructure and ecosystem conditions, including internet reliability and platform stability determine whether adoption is technically feasible and economically viable (Argyroudis *et al.*, 2022; Mallo *et al.*, 2024).

In developing countries, these determinants become even more critical due to structural constraints such as weak infrastructure, limited institutional support, and high uncertainty in digital ecosystem (Munir *et al.* 2024; Ochinanwata *et al.*, 2024; Omweri *et al.*, 2024). Studies consistently show that MSEs in developing economies faces additional barriers include inadequate digital literacy, high cost of digital tools, limited access to finance, and unreliable connectivity (Akpe *et al.*, 2023; Cueto *et al.*, 2022; Rujitoningtyas *et al.*, 2024). These challenges intensify the complexity of adoption decisions, making digital transformation more dependent on contextual conditions.

In the Ethiopian context, digital transformation has gained increasing policy and academic attention due to its potential contribution to economic modernization and inclusive growth. Recent studies show that Ethiopia is experiencing rapid digital expansion in sectors such as banking, agriculture, and public services by national digital strategies and increasing mobile penetration (Adame, 2021; Ferede *et al.*, 2025; Hordofa *et al.*, 2024). For instance, digital financial systems and mobile payment platforms have been identified as key factors of financial inclusion and operational efficiency among businesses (Menza *et al.*, 2024; Mossie, 2022). Similarly, digital infrastructure development gradually improves access to digital services, although significant gaps remain outside urban centers (Desta *et al.*, 2018; Wassie *et al.*, 2023; Zemene *et al.*, 2026).

However, opposite of these progresses, many Ethiopian MSEs continue to lag behind in digital adoptions. Empirical studies reveal that adoption is often constrained by limited digital skills, low trust in digital transactions, high perceived risk, and infrastructural inefficiencies (Abera, 2025; Ferede *et al.*, 2025; Yimer *et al.*, 2026). Additionally, financial constraints and lack of organizational readiness further hinder the integration of digital tools into daily business operations (Gebreegziabher, 2020; Melesse *et al.*, 2025). Even when digital tools are available, many small enterprises fail to fully utilize them due to inadequate capability and uncertainty about their benefits (Engidaw, 2022; Eyasu, 2016; Senshaw & Twinomurinzi, 2022).

Despite existing research, several important gaps remain. First, most existing studies focuses on MSEs in developed countries rather than examining how multiple factors developing economies. There is also limited understanding of how environmental pressures, organizational capabilities, and perceived risks combine

to produce different adoption patterns among MSEs.

Therefore, this study addresses these gaps by examining digital adoption shaped by interacting forces of pressure, capability, environment, and perception. By doing so, it aims to provide a more realistic and nuanced understanding of how MSEs in developing economies particularly in Afar region, Ethiopia navigate the complexities of digital transformation.

LITERATURE REVIEW

Theoretical Foundations

This study is anchored in an integrated theoretical framework that combines insights from diffusion, capability, institutional, and behavioral perspectives to explain digital adoption among micro and small enterprises. The diffusion of innovations provides the baseline explanation, arguing that adoption decisions are influenced by social systems, communication channels, and perceived characteristics of innovations (Polyakov & Kovshun, 2021). However, classical diffusion assumes gradual adoption, whereas threshold-based extensions emphasize that adoption accelerates only after a critical mass is reached, making peer dynamics nonlinear rather than incremental (Vij, 2026).

Complementing this, the absorptive capacity framework explains how firms' internal capabilities shape their ability to recognize, assimilate, and exploit new technologies (Lichtenthaler & Lichtenthaler, 2009; Martinez-Sanchez *et al.*, 2019). This is particularly relevant for algorithmic literacy, which reflects the cognitive and technical readiness required for digital transformation (Spurava & Kotilainen, 2023). Without such capacity, exposure to innovation does not necessarily translate into adoption (Calel, 2020).

The study also draws on institutional theory, which posits that organizational behavior is influenced by regulatory, normative, and cognitive structures. Reliable digital ecosystems reduce uncertainty and transaction costs, thereby facilitating adoption (Lin & Yeh, 2025; King *et al.*, 2025). In contrast, weak institutional environments increase perceived risks and discourage engagement with digital systems (Abayomi *et al.*, 2020; Krishna *et al.*, 2023). From a market perspective, demand-pull innovation explains how customer expectations and competitive pressures act as external drivers of technological change (Boyer & Kokosy, 2022; Hötte, 2021; Roy, 2024). Firms respond strategically to maintain legitimacy and competitiveness, making customer digital pressure a key determinant (Mithas *et al.*, 2013).

Finally, behavioral and resource-based perspectives are incorporated through perceived risk and bricolage (Abid *et al.*, 2023). While perceived risk captures uncertainty and trust barriers that inhibit adoption, bricolage emphasizes how resource-constrained firms creatively recombine available assets to enable innovation (Xu *et al.*, 2024). Together, these perspectives provide a comprehensive explanation of both enabling and constraining forces shaping digital adoption (Wang & Zhang, 2025).

Determinant Factors and Digital Adoption Peer Adoption Density and Digital Adoption

Empirical studies consistently show that peer effects play a critical role in shaping technology adoption, particularly among small firms embedded in dense social and business networks (Zhang *et al.*, 2018). Evidence suggests that firms are more likely to adopt innovations when they observe successful implementation by similar actors, reducing uncertainty and perceived risk (Roper & Tapinos, 2016). However, recent studies challenge the assumption of linear peer influence, demonstrating that adoption often follows a nonlinear pattern where minimal exposure has little effect, but adoption accelerates significantly once a critical mass is reached (Li *et al.*, 2025). This threshold effect has been observed in digital platform adoption, mobile payment systems, and e-commerce participation in developing economies (Kumar *et al.*, 2021). Such findings indicate that imitation alone is insufficient; instead, visibility, legitimacy, and collective momentum are required to trigger widespread adoption (Chandler & Hwang, 2015).

H1: High peer adoption density has a positive effect on digital adoption among MSEs.

Algorithmic Literacy and Digital Adoption

The empirical literature highlights digital capability as a central determinant of technology adoption. Firms with higher levels of technical knowledge, data-processing skills, and digital awareness are more likely to adopt and effectively utilize digital technologies (Bilal *et al.*, 2026; Nikou *et al.*, 2022). Studies on SMEs in emerging economies show that lack of digital skills is a major barrier, even when infrastructure is available (Idemudia *et al.*, 2023; Rampaul, 2025). Algorithmic literacy, in particular, enhances firms' ability to interpret data, engage with digital platforms, and optimize decision-making processes (Frau-Meigs, 2024). Empirical evidence confirms that firms with stronger internal competencies are not only more likely to adopt digital tools but also derive greater value from them, reinforcing the role of capability as both an enabler and performance driver (Kastelli *et al.*, 2024; Wang *et al.*, 2024).

H2: Algorithmic literacy positively influences digital adoption among MSEs.

Customer Digital Pressure and Digital Adoption

A growing body of empirical research identifies customer expectations as a powerful driver of digital transformation. As consumers increasingly demand online services, digital payments, and real-time interactions, firms are compelled to adopt digital technologies to remain competitive (Putrevu & Mertzanis, 2024; Yadav & Pavlou, 2020). Studies across retail, service, and manufacturing sectors show that customer pressure often outweighs internal readiness, forcing firms to adapt even under resource constraints (Kung *et al.*, 2015; Uddin & Jayaram, 2025). This demand-side effect is particularly strong in urban and semi-urban markets where digital penetration is

higher (Palsule-Desai & Seshadri, 2021). Empirical findings consistently demonstrate that as customer digital expectations intensify, firms are more likely to adopt digital solutions to maintain market relevance and customer satisfaction (Demirel, 2022; Kopalle *et al.*, 2020).

H3: Customer digital pressure has a positive effect on digital adoption among MSEs.

Ecosystem Reliability and Digital Adoption

Empirical evidence underscores the importance of institutional and infrastructural conditions in facilitating digital adoption. Reliable internet connectivity, secure payment systems, supportive regulations, and trustworthy platforms significantly enhance firms' willingness to adopt digital technologies (Putrevu & Mertzanis, 2024; Tadi, 2023). Studies in developing countries reveal that weak ecosystems characterized by unreliable networks and regulatory uncertainty discourage adoption by increasing operational risks (Karmaker *et al.*, 2023; Parente *et al.*, 2019). Conversely, strong ecosystems reduce transaction costs and build trust, enabling even small firms to participate in digital markets (Das, 2023; Song *et al.* 2022). Empirical findings consistently confirm that ecosystem reliability is a critical enabler of digital transformation (Kleinschmidt *et al.*, 2025; Kumar, 2024).

H4: Ecosystem reliability positively affects digital adoption among MSEs.

Internet Cost and Digital Adoption

Cost-related barriers remain one of the most consistently identified constraints in technology adoption literature. Empirical studies show that high internet costs significantly reduce both access to and usage of digital technologies, particularly among small and resource-constrained firms (Lahon & Chimpi, 2024; Karanasios *et al.*, 2026). In many developing contexts, the cost of data and digital services represents a substantial share of operational expenses, limiting firms' ability to adopt and sustain digital practices (Martínez-Peláez *et al.*, 2023; Shahadat *et al.*, 2023). Evidence also suggests that cost sensitivity is higher among micro-enterprises, making affordability a decisive factor (Ferejo *et al.*, 2022). As a result, even when other enabling conditions are present, high costs can suppress adoption (Quigley & Burke, 2013; Zhong *et al.*, 2025).

H5: Internet cost negatively affects digital adoption among MSEs.

Perceived Risk and Digital Adoption

The role of perceived risk in technology adoption is well documented in empirical research, particularly in the context of digital transactions. Concerns related to security, privacy, fraud, and system reliability significantly influence firms' willingness to adopt digital platforms (Andriani *et al.*, 2020; Suri *et al.*, 2024). Studies show that higher perceived risk reduces trust and increases resistance to adoption, especially in environments where regulatory protections are weak (Giampietri *et al.*, 2020; Kenesei *et al.*, 2022). Empirical findings across e-commerce and

digital finance consistently indicate that risk perception is a major barrier, often outweighing potential benefits in the decision-making process (Amornkitvikai *et al.*, 2025; Lei *et al.*, 2025).

H16: Perceived risk negatively influences digital adoption among MSEs.

Digital Bricolage and Digital Adoption

Empirical research on entrepreneurship highlights bricolage as a key mechanism through which resource-constrained firms innovate and adopt new technologies. Studies show that firms engaging in bricolage creatively recombining available resources are more adaptable and resilient in dynamic environments (Abukari *et al.* 2024; Park & Seo, 2024; Simba *et al.*, 2021). In the context of digital adoption, bricolage enables firms to experiment with low-cost solutions, repurpose existing tools, and overcome resource limitations (Karanasios *et al.*, 2026). Evidence from SMEs in developing economies confirms that bricolage positively influences both the likelihood and effectiveness of digital adoption, particularly where formal support systems are limited (Flaminiano, 2024; Lanivich *et al.*, 2026; Li *et al.*, 2025).

H17: Digital bricolage positively affects digital adoption among MSEs.

MATERIALS AND METHODS

This study adopted an explanatory research design with quantitative research approach to examine the determinants actors of digital adoption among MSEs.

Primary data were collected from a sample of 317 respondents using a structured questionnaire designed to capture relevant socio-demographic characteristics and key explanatory variables aligned with the study objectives. A cross-sectional survey strategy was employed, ensuring efficiency in data collection while maintaining sufficient variability across observations for robust statistical analysis.

Prior to estimation, the dataset was carefully screened and cleaned to address missing observations, coding inconsistencies, and potential outliers that could bias the results. Descriptive statistics were then generated to summarize key characteristics of the variables and to provide an initial understanding of their distributional patterns.

To test the hypothesized relationships, a binary probit regression model was estimated in Stata 14, appropriate for the dichotomous nature of the dependent variable. The model specifies the probability of the outcome equaling one as a function of a set of theoretically and empirically grounded explanatory variables capturing economic, behavioral, and contextual determinants.

For substantive interpretation, marginal effects were computed to translate coefficient estimates into changes in predicted probabilities, allowing more intuitive interpretation of the results. Model fit and adequacy were evaluated using likelihood ratio tests and pseudo-R-squared measures, ensuring that the explanatory variables jointly improve model performance relative to a null specification. Multicollinearity among predictors was

Table 1: Demographic profile

Variable	Category	Proportion of Adopters (%)	Proportion of non-adopters (%)	Calculated χ^2
Gender of enterprise's manager	Male	82.94	17.06	15.964***
	Female	60.00	40.00	
Age of enterprise	Less than 2 years	48.57	51.43	21.376***
	2-5 years	69.44	30.56	
	6-10 years	83.78	16.22	
	Above 10 years	91.18	8.82	
Educational level of enterprise's manager	Literate	90.32	9.68	38.629***
	Illiterate	61.07	38.93	
Sector of the enterprise	Manufacturing	88.57	11.43	18.942***
	Construction	80.00	20.00	
	Service	73.68	26.32	
	Trade	67.86	32.14	
	Urban agriculture	54.55	45.45	
Ownership structure	Sole proprietorship	65.38	34.62	12.487**
	Partnership	84.62	15.38	
ICT Training	Yes	89.93	10.07	139.184***
	No	14.29	85.71	
Access to internet	High	94.74	5.26	55.751***
	Moderate	84.44	15.56	
	Low	40.74	59.26	

***Significant at 1%; **Significant at 5%.

assessed using variance inflation factors to confirm that intercorrelations did not undermine coefficient stability. To strengthen statistical inference, robust standard errors were applied to correct for potential heteroskedasticity. Overall, the estimation strategy follows standard econometric practice for limited dependent variable models, ensuring consistency, reliability, and interpretability of results in explaining the determinants of the binary outcome.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 presents the demographic profile of adopters and non-adopters and shows significant associations between enterprise characteristics and adoption status. The chi-square test results indicate that gender significantly influences adoption at the 1% significance level ($\chi^2 = 15.964$). Male-managed enterprises had a higher adoption rate (82.94%) compared to female-managed enterprises (60.00%), suggesting gender differences in technology adoption behavior. Enterprise age also significantly affected adoption ($\chi^2 = 21.376$), with adoption rates increasing as enterprises become older. Enterprises operating for more than 10 years recorded the highest adoption rate (91.18%), while those operating for less than two years had the lowest adoption rate (48.57%). Educational level was another important determinant ($\chi^2 = 38.629$), as literate managers were more likely to adopt

digital technologies than illiterate managers. Sectoral differences were also significant ($\chi^2 = 18.942$), with manufacturing enterprises showing the highest adoption level. Ownership structure significantly influenced adoption at the 5% level ($\chi^2 = 12.487$), where partnerships adopted more than sole proprietorships. Additionally, ICT training and internet access strongly promoted adoption, indicating the importance of digital knowledge, connectivity, and technological capability in enhancing enterprise innovation and digital transformation.

Inferential Statistics

Diagnostic Tests

The multicollinearity test results indicate the absence of serious multicollinearity problems among the explanatory

Table 2: Multicollinearity test

Variable	VIF	1/VIF
Internet cost	1.37	0.731
Customer digital pressure	1.20	0.835
Peer adoption density	1.19	0.843
Algorithmic literacy	1.07	0.938
Ecosystem reliability	1.06	0.946
Perceived risk	1.05	0.949
Digital bricolage	1.02	0.977
Mean VIF	1.14	-

Table 3: Determinants of digital adoption among MSEs

Variables	Coefficient and std. error	Marginal effect and std. error
Peer adoption density		
(2) Medium	.850(.440)	0.149 (0.096)
(3) High	1.294** (.525)	0.205* (0.101)
Algorithmic literacy= Literate	.626** (.226)	0.093** (0.036)
Customer digital pressure		
(2) Medium	.689** (.303)	0.117** (0.052)
(3) High	1.788*** (.408)	0.230*** (0.060)
Ecosystem reliability= Reliable	1.222*** (.251)	0.178*** (0.034)
Internet cost= Expensive	-1.915*** (.327)	-0.437*** (0.015)
Perceived risk of digital transactions	-.375*** (.127)	-0.048*** (0.015)
Digital bricolage	.298*** (.076)	0.038*** (0.010)
Constant	-1.09(.660)	

Note: Number of obs=317; Wald χ^2 (9) =144.67 (Prob> χ^2 =0.0000); Log pseudolikelihood = -73.944985; Pseudo R² = 0.5548

variables. The VIF values range from 1.02 to 1.37, which are far below the critical threshold of 10. Similarly, the tolerance values (1/VIF) are sufficiently high. The mean VIF of 1.14 further confirms that multicollinearity is not a concern.

Table 3 presents the results of the robust Probit model estimating the determinants of digital adoption among MSEs. The model was estimated using robust standard errors to correct for possible heteroskedasticity and to ensure reliable statistical inference. The overall model

is statistically significant, as indicated by the Wald χ^2 value of 144.67 with a probability value less than 0.001, implying that the explanatory variables jointly influence digital adoption decisions among MSEs. Furthermore, the pseudo-R² value of 0.5548 suggests that the model has strong explanatory power in explaining variations in digital adoption behavior.

The findings reveal that peer adoption density significantly affects digital adoption among enterprises. Although medium peer adoption density has a positive but statistically

insignificant effect, high peer adoption density positively and significantly increases the probability of adoption. Specifically, enterprises operating in environments with high peer adoption are 20.5 percentage points more likely to adopt digital technologies compared to those with low peer adoption exposure. This result suggests that enterprises are strongly influenced by the behavior of surrounding firms, and digital adoption tends to spread through social and business networks once adoption reaches a critical mass.

Algorithmic literacy also shows a positive and statistically significant effect on digital adoption. The marginal effect indicates that enterprises with algorithmic literacy are 9.3 percentage points more likely to adopt digital technologies than those lacking such literacy. This implies that enterprises possessing better digital knowledge, technical awareness, and understanding of digital systems are more capable of integrating technology into their operations. The result highlights the importance of human capital and digital competence in enhancing technological transformation among MSEs.

Customer digital pressure emerges as one of the strongest determinants of adoption behavior. Enterprises facing medium customer digital pressure are 11.7 percentage points more likely to adopt digital technologies, while those experiencing high customer digital pressure are 23.0 percentage points more likely to adopt. These findings indicate that increasing customer expectations for digital services, online transactions, and electronic communication strongly encourage enterprises to engage in digital transformation. The result confirms that market demand and customer behavior are important external driving forces behind digital adoption.

Ecosystem reliability is another significant factor positively influencing digital adoption. Enterprises operating within reliable digital ecosystems are 17.8 percentage points more likely to adopt digital technologies compared to enterprises in unreliable environments. This suggests that stable infrastructure, dependable digital platforms, institutional support, and trust in digital systems reduce uncertainty and encourage enterprises to adopt new technologies.

Conversely, internet cost has a strong negative and statistically significant effect on adoption. Enterprises perceiving internet services as expensive are 43.7 percentage points less likely to adopt digital technologies. This finding identifies internet affordability as the most serious barrier to digital transformation among MSEs. Similarly, perceived risk of digital transactions negatively affects adoption, reducing the probability of adoption by 4.8 percentage points. This indicates that concerns related to cyber security, fraud, privacy, and transaction uncertainty discourage enterprises from adopting digital technologies.

Finally, digital bricolage positively and significantly affects digital adoption. Enterprises with greater bricolage capability are 3.8 percentage points more likely to adopt digital technologies. This implies that firms capable

of creatively utilizing and recombining limited digital resources can better overcome operational and financial constraints during digital transformation.

Overall, the results demonstrate that digital adoption among MSEs is positively driven by peer influence, digital literacy, customer pressure, ecosystem reliability, and digital bricolage, while high internet cost and perceived transaction risk significantly hinder adoption decisions.

CONCLUSION

This study examined the determinants of digital adoption among micro and small enterprises by considering diffusion, capability, institutional, economic, and behavioral factors. The findings reveal that digital adoption is shaped by both enabling conditions and structural constraints. The results indicate that peer adoption density significantly enhances digital adoption, particularly when adoption becomes widespread within enterprise networks, confirming the importance of social diffusion effects. Algorithmic literacy also positively influences adoption, demonstrating that firms with better digital knowledge and technical capability are more prepared to integrate digital technologies into their operations. The study further found that customer digital pressure is a major driving force behind digital adoption, implying that increasing customer demand for digital services compels enterprises to modernize their business practices. Likewise, ecosystem reliability positively supports adoption by creating trust, reducing uncertainty, and improving the effectiveness of digital operations. In contrast, internet cost remains the most significant barrier, showing that affordability challenges continue to hinder digital transformation among MSEs. Perceived risk also negatively affects adoption due to concerns related to security and transaction uncertainty. Moreover, the positive contribution of digital bricolage suggests that enterprises with the ability to creatively utilize limited resources are better able to overcome operational constraints and adopt digital technologies. Overall, the study concludes that successful digital transformation among MSEs requires improvements in digital capability, affordable internet access, reliable digital infrastructure, and trust-building mechanisms to create a supportive environment for broader digital adoption.

Practical Implications

The findings of this study provide practical implications for micro and small enterprise owners, development practitioners, and digital service providers. Enhancing digital literacy, improving access to affordable internet services, and strengthening digital support ecosystems can significantly accelerate digital adoption among MSEs. The study also suggests that promoting peer-learning networks and customer-oriented digital strategies may increase firms' readiness to adopt digital technologies. Furthermore, encouraging resource-constrained enterprises to utilize innovative and adaptive practices can improve their competitiveness and operational efficiency

in the digital economy.

Policy Implications

The study offers important policy implications for governments and policymakers in developing economies. Policymakers should prioritize investments in digital infrastructure, affordable internet accessibility, and entrepreneurship-focused digital training programs. Policies that strengthen institutional trust, cybersecurity awareness, and digital ecosystem reliability are also essential to encourage wider digital adoption among MSEs. In addition, governments should design inclusive digital transformation policies that support small enterprises through innovation hubs, financial incentives, and collaborative digital platforms to accelerate sustainable economic development.

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Conflict of Interest

The authors declare no conflict of interest regarding the publication of this paper.

Ethical Consideration

The study was conducted in accordance with ethical research standards. Participation of respondents was voluntary, and confidentiality of the information provided was fully maintained throughout the study.

Data Availability Statement

The data used in this study are available from the corresponding author upon reasonable request.

Author Contributions

Abdu Kamil led conceptualization, methodology, data analysis, interpretation, and manuscript drafting. Dagnachew Tamene handled data collection and literature review. Ebrahim Misganaw supported data organization and manuscript revision. All authors approved the final manuscript.

Future Research Direction

Future studies may extend this research by employing longitudinal data, comparative regional analysis, or mixed-method approaches to further explore digital adoption dynamics among enterprises in developing economies.

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