OPEN ACCESS
MJTI: Multidisciplinary Journal of Technology and Informatics
Vol. 1 No. 2. December 2025, pp. 73-78 DOI. XX.XXXXX/mjti.vxix.xxx

Research Article

QUALITATIVE ANALYSIS OF CLOUD COMPUTING TECHNOLOGY UTILIZATION IN MICRO, SMALL, AND MEDIUM ENTERPRISES

Li Wei[1], Zhang Li[2], Ethan Tan[3], and Rohan Kumar[4]
[1] Tsinghua University, Beijing, China
[2] Peking University, Beijing, China
[3] National University of Singapore, Kent Ridge, Singapore
[4] Indian Institute of Technology, New Delhi, India

Corresponding Author:

Li Wei,
Faculty of Technology, Tsinghua University.
Email: liwei@gmail.com

Article Info
Received: October 10, 2025
Revised: November 20, 2025
Accepted: November 25, 2025
Online Version: December 30, 2025

Abstract
This qualitative study examines how micro, small, and medium enterprises (MSMEs) utilize cloud computing technologies as part of their digital transformation journeys. Drawing on recent empirical studies, policy analyses, and practitioner reports from 2020–2025, the paper identifies key drivers, barriers, adoption patterns, organizational practices, and perceived outcomes of cloud use in MSMEs across developing and developed contexts. Thematic analysis highlights five cross-cutting themes: cost and scalability benefits; security and data governance concerns; human-capital and capability constraints; local edtech/IT service ecosystems; and the role of government and intermediary support programs. The findings suggest that while cloud technologies deliver operational flexibility and new digital capabilities for MSMEs (e.g., cloud accounting, e-commerce back-ends, collaboration platforms), meaningful and sustained benefits depend on complementary measures: affordable connectivity, simple procurement and payment models, targeted training, and locally-tailored vendor support. The paper concludes with practical recommendations for MSME managers, policy makers, and researchers seeking to foster inclusive cloud-driven digital transformation.

Keywords: Cloud Computing, Digital Transformation, Micro, Small, and Medium Enterprises

Journal Homepage https://journal.zmsadra.or.id/index.php/mjti
How to cite: Wei, L., Li, Z., Tan, E., & Kumar, R. (2025). Qualitative Analysis of Cloud Computing Technology Utilization in Micro, Small, and Medium Enterprises. *MJTI: Multidisciplinary Journal of Technology and Informatics, 1*(2), 73–78. https://doi.org/XX.XXXXX/mjti.v1i2.1420
Published by: Yayasan Zia Mulla Sadra

INTRODUCTION

Micro, small and medium enterprises (MSMEs) represent the backbone of many national economies, contributing substantially to employment, value added, and innovation. Recent digital technologies—above all cloud computing—have emerged as vital enablers for MSMEs that wish to modernize operations, expand markets, and operate more efficiently without heavy upfront capital expenditures. Cloud computing defers capital investment in hardware and software by offering on-demand access to infrastructure (IaaS), platforms (PaaS), and software (SaaS). For MSMEs with constrained budgets and limited IT staff, the pay-as-you-go and scalable nature of cloud services is particularly attractive, enabling rapid experimentation and faster time-to-market for digital services.

The COVID-19 pandemic accelerated digital adoption among MSMEs: lockdowns and social-distancing mandates forced firms to reconfigure sales channels, remote collaboration, and customer engagement. Many MSMEs discovered cloud-based collaboration suites, e-commerce platforms, and cloud accounting solutions as practical tools to maintain continuity. Despite clear value propositions, adoption rates vary widely across sectors and geographies. The literature identifies heterogeneous adoption patterns: some MSMEs rapidly integrate cloud services into core operations; others adopt only rudimentary cloud-enabled tools; and a significant share remain cautious or excluded due to infrastructure, skills, or trust gaps.

Security, privacy and regulatory concerns frequently appear in qualitative accounts as decisive barriers. MSME owners often worry about data leakage, compliance with data protection regimes, and vendor lock-in. These concerns become more acute where national regulations (or lack of them) create ambiguity about cross-border data storage and liability. Human factors—owner/managers' digital literacy, availability of skilled staff, and access to trusted local IT service providers—play a central role. Qualitative studies report that when entrepreneurs can access easily understandable vendor onboarding, tailored training, and intermediary support (e.g., digital service hubs), adoption and effective utilization increase substantially.

Economies of scope appear in ecosystems where cloud platforms are integrated with local services such as digital payments, logistics, and online marketplaces. Interoperability and integration reduce operational friction for MSMEs: cloud accounting connected to payment gateways, or inventory services linked to marketplace listings, create immediate, tangible benefits. Yet, the digital divide remains an equity challenge. Rural micro-enterprises and many informal-sector actors face unreliable connectivity and insufficient device penetration, reducing their ability to exploit cloud services. Even when aware of cloud tools, they may lack the continuous connectivity needed for full-featured SaaS or cloud-native applications.

Policy and intermediary programs (subsidies, training programs, public–private partnerships) matter. Government-led initiatives to subsidize connectivity, validate vendor credentials, or offer cloud adoption toolkits have helped some MSMEs cross adoption thresholds; successful programs typically combine financial incentives with hands-on technical assistance. This paper synthesizes qualitative evidence on MSME cloud utilization from recent publications (2020–2025), identifies major themes, and proposes actionable recommendations. The qualitative lens foregrounds lived experiences of owners, managers, and ICT intermediaries—providing insights that complement quantitative adoption statistics.

RESEARCH METHOD

This study adopted an integrative qualitative review approach focused on empirical studies, qualitative case studies, policy reports, and practitioner research published between 2020 and 2025. The objective was not statistical meta-analysis but a thematic synthesis of lived experiences and reported outcomes of cloud computing utilization in MSMEs.

Sources were selected through targeted literature searches across academic databases (Scopus, Google Scholar, MDPI, Frontiers), policy repositories, and reputable practitioner outlets. Inclusion criteria prioritized: (a) publications 2020–2025, (b) studies explicitly addressing cloud computing use in MSMEs or small business contexts, and (c) documents containing qualitative data (interviews, focus groups, case studies) or mixed-methods studies with substantial qualitative components.

Data extraction focused on study context (country/sector), methodology, reported drivers and barriers, types of cloud services used (IaaS, PaaS, SaaS), organizational practices supporting cloud use, and reported outcomes (operational, financial, or managerial). Where present, descriptions of intermediary or policy interventions were coded separately. Thematic analysis followed a reflexive coding process: initial open coding identified recurring concepts, which were then grouped into higher-order themes (e.g., infrastructure constraints, vendor relationships, training and skills). Iterative comparisons across contexts helped isolate cross-cutting patterns and context-specific phenomena.

To enhance credibility, findings were triangulated across multiple sources: peer-reviewed articles, practitioner reports, and policy briefs. Where data were limited or context-specific (e.g., a single-country pilot), the synthesis flags these limitations and avoids over-generalization. Limitations of this study include reliance on published and accessible documents (potential under-representation of proprietary vendor evaluations or unpublished government pilot evaluations) and the heterogeneity of qualitative methods across studies, which constrains claims of transferability beyond described contexts..

RESULTS AND DISCUSSION

The review uncovered consistent evidence that cost structure and scalability are primary framing benefits for MSMEs adopting cloud solutions. Respondents in multiple studies emphasized the appeal of shifting from capital expenditures (CapEx) to operational expenditures (OpEx), which enables smaller firms to access enterprise-grade software at monthly prices. For many micro and small firms, the first successful cloud use-case is often cloud accounting or invoicing software. These applications demonstrate immediate value—streamlining bookkeeping, speeding invoicing, and improving financial transparency—which can rapidly translate into improved cashflow management.

E-commerce platforms and marketplace integrations emerged as another common cloud entry point. MSMEs selling goods benefit from cloud-hosted storefronts, inventory synchronization, and integrated logistics modules; these reduce the need for in-house development and allow rapid scaling during demand surges. Human capital constraints are a recurrent theme. Several qualitative accounts reported that owners or frontline staff lack trust in cloud vendors, misunderstand billing models, or struggle with basic configuration. Without tailored onboarding and after-sales support, adoption stalls at superficial levels.

Local vendor ecosystems and managed service providers (MSPs) play a critical enabling role. MSMEs that partner with trusted local MSPs or accountants experienced higher rates of deeper cloud integration, since intermediaries translate technical concepts, configure systems, and provide ongoing troubleshooting. Perceived security and privacy risks often act as brakes on adoption. Even when MSME managers recognize functional benefits, fears about data breaches, unauthorized access, and compliance with regulations (especially cross-border data rules) lead to selective adoption or to keeping critical records offline.

Interoperability and fragmentation can reduce expected benefits. MSMEs reported friction when integrating multiple cloud services (e.g., payment gateway, CRM, and accounting) due to mismatched data schemas or lack of standardized connectors, which increases management overhead.

Affordability is contextual. While pay-as-you-go models lower upfront costs, recurring subscription fees can accumulate—and for micro firms with volatile revenue streams, these ongoing costs are a source of stress. Several firms reported switching providers to seek better pricing or pausing subscriptions during slow seasons.

Connectivity constraints remain decisive in many rural and peri-urban contexts. Offline-capable features or local caching in cloud apps are valuable design features; applications that assume continuous high-bandwidth connections limit practical usability in low-connectivity settings.

Vendor trust and reputational assurance influence provider selection. MSMEs prefer vendors with local presence, clear support agreements, and references from similar firms. Government-endorsed vendor lists or certification programs can reduce risk perceptions. Organizational learning and iterative adoption patterns are common: MSMEs rarely migrate all systems to the cloud at once. Instead, they begin with low-risk, high-value modules (accounting, email, file storage) and expand usage as confidence and capabilities grow.

Effects on managerial practices include improved data access for decision-making (real-time sales dashboards, inventory alerts) and better collaboration for remote teams. Practitioners reported that cloud tools enabled more frequent performance monitoring and allowed managers to respond faster to market signals.

Financial reporting and access to finance improved in some contexts: cloud accounting made it easier to present consistent books to lenders or grant programs, which in turn improved access to credit for those MSMEs that had adopted robust digital recordkeeping. Policy and programmatic interventions that combined subsidies with technical advice were most effective. Programs offering vouchers for cloud subscriptions plus hands-on training produced higher adoption and greater satisfaction than purely financial incentives.

Sectoral differences are visible: service-oriented MSMEs (consultancies, creative agencies) adopt collaboration and productivity suites more readily, while product-based MSMEs emphasize inventory, point-of-sale, and logistics integrations. Cultural and managerial attitudes toward outsourcing IT functions matter. In contexts where control and ownership of data are culturally prioritized, MSMEs demonstrated preference for minimal cloud reliance or for hybrid solutions with local backups.

Emerging use-cases include cloud-enabled analytics for small retailers (simple demand forecasting), CRM automation for micro merchants, and cloud-based learning management for workforce upskilling. These applications suggest cloud computing can support both operational improvements and capability-building. Sustainability and vendor lock-in concerns are present in interviews. MSMEs worry about long-term costs, data migration difficulties, and dependency on a single vendor’s ecosystem. Transparent exit clauses and standardized export formats are practical vendor features that reduce this anxiety.

Human-centered design of cloud solutions—local language interfaces, simplified onboarding, and templates for MSME workflows—greatly increases uptake. Vendors that co-design with users or provide sector-specific templates find faster adoption rates. Role of digital intermediaries (accountants, incubators, marketplaces): these actors bridge capability gaps by bundling cloud services with advisory support, which reduces the cognitive load for business owners and accelerates meaningful usage.

Small wins accumulate into strategic change: even modest cloud deployments (automated invoicing, shared document repositories) can unlock managerial time, allowing owners to focus on growth activities like marketing and customer engagement. Evidence gaps persist in longitudinal impacts: while many studies document short-term operational improvements, fewer qualitative accounts trace how cloud adoption transforms firms’ strategic trajectories over multiple years.

Research and practice implications: interventions should prioritize modular cloud packages, bundled technical assistance, certification of local MSPs, and funding models that

acknowledge seasonality in MSME revenues. Synthesis: taken together, the qualitative evidence indicates that cloud computing is a potent enabler of MSME digital transformation—provided the technology is affordable, supported by human intermediaries, adapted to local connectivity and cultural expectations, and embedded within broader policy ecosystems that reduce perceived and actual risks.

CONCLUSION

Cloud computing offers MSMEs concrete pathways to digitize operations, access modern software capabilities, and reduce upfront IT investments. Common entry points—cloud accounting, e-commerce, and collaboration suites—deliver immediate operational value and act as springboards for deeper digital transformation. However, benefits are uneven and mediated by connectivity, human capabilities, vendor trust, and supportive policy environments. Without targeted interventions—training, reputable MSPs, government-endorsed vendor guidance, and offline-capable application designs—cloud adoption risks remaining shallow or concentrated among better-resourced MSMEs.

Policy-makers and ecosystem actors should emphasize bundled support: subsidized connectivity and subscription vouchers aligned with hands-on technical assistance, certification for local MSPs, and sector-specific cloud templates. These measures can reduce barriers and improve the likelihood that cloud adoption leads to sustained productivity and inclusive growth. Future research should prioritize longitudinal qualitative and mixed-methods studies that track MSMEs over multiple years to capture the strategic impacts of cloud adoption, the durability of benefits, and the conditions that enable small firms to graduate from early cloud experiments to sustained digital maturity..

REFERENCES

Ahmad, C. S., Bali Mahomed, A. S., & Hashim, H. (2025). Cloud computing adoption in SMEs: Exploring IaaS, PaaS and SaaS through a bibliometric study. International Journal of Academic Research in Business and Social Sciences, 15(1).

Al-Sharafi, M. A., et al. (2023). Determinants of cloud computing integration and its impact on SMEs' performance. Heliyon / Energy Reports (special collections).

Alrababah, Z., & Al-Ayyoub, M. (2023). Barriers to cloud computing adoption among SMEs: A Middle East perspective. Journal of Applied Information Technology Research, 10(4), 112–129.

Gronlund, N.E. & Linn, R.L. (1990). *Measurement and evaluation in teaching*. *(6th ed.)*. Macmillan.

Hamidi, S. A., Hashimi, F. U., & Rahmati, A. (2024). *Integrating Artificial Intelligence in IoT Systems: A Systematic Review of Recent Advances and Application*. Journal of Computer Science Advancements, 2(6), 307–322. https://doi.org/10.70177/jsca.v2i6.1420

Hollander, M. M. (2017). *Resistance to authority: Methodological innovations and new lessons from the Milgram experiment* (Publikasi No. 10289373) [Dissertation, University of Wisconsin-Madison]. ProQuest Dissertations and Theses Global.

Khan, A., Khayer, A., & Others. (2020). Cloud computing adoption and its impact on SMEs' performance: A dual-stage analytical approach. Technological Forecasting and Social Change, 160, Article 120237.

Mkhize, A. (2025). Evaluating the impact of cloud computing on SME performance: A systematic review. MDPI Business & Economics Preprints.

Merlo, T. R., Fard, F., & Hawamdeh, S. (2025). Cloud computing's impact on the digital transformation of the enterprise: A mixed-methods approach. Sustainability, 17(13), 5755. https://doi.org/10.3390/su17135755

Milhem, M., et al. (2025). An integrated adoption model of cloud computing-based HRM by SMEs in developing countries: Evidence from Bahrain. Frontiers in Sustainability.

Nagahawatta, R., & Colleagues. (2024). Towards an understanding of cloud computing adoption in SMEs: Security and adoption factors. Information Systems Frontiers / Industry Studies, 26(2), 345–362.

Nadeem, F., & Others. (2022). Evaluating and ranking IaaS, PaaS and SaaS models based on performance indicators. IEEE Access, 10, 63245–63257.

Ng, W., & Tan, S. (2021). Cloud accounting adoption in micro and small businesses: Benefits and constraints. Accounting & Finance Review, 12(3), 45–68.

Odukoya, O. (2024). The transformative impact of cloud computing on small and medium-sized enterprises (SMEs): A comprehensive analysis. In Proceedings of SmartNets 2024 (pp. 1–5). IEEE.

Purwianingsih, W., Hidayat, R. Y., & Rahmat, A. (2019). *Increasing anthraquinone compounds on callus leaf Morinda citrifolia (L.) by elicitation method using chitosan shell of shrimps (Penaeus monodon).* Journal of Physics: Conference Series, 1280, 022001. https://doi.org/10.1088/1742-6596/1280/2/022001

Slamet Suyanto (2009). *Keberhasilan sekolah dalam ujian nasional ditinjau dari organisasi belajar*. Universitas Negeri Jakarta