

# STRATEGIC DRIVERS AND BARRIERS TO CLOUD COMPUTING ADOPTION: A DIGITAL TRANSFORMATION PERSPECTIVE OF MSMES

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## Abstract

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In an era where digital transformation increasingly defines business sustainability, micro, small, and medium enterprises (MSMEs) face critical decisions in adapting to emerging technologies. This study focuses on the strategic adoption of cloud computing among MSMEs in Nueva Ecija, highlighting the drivers, barriers, and organizational dynamics that influence technology integration. Anchored in the principles of strategic alignment and digital readiness, and informed by digital transformation frameworks, such as Adama and Okeke (2024), the research utilizes a descriptive quantitative design to gather insights from 51 participating enterprises across varied sectors. The findings reveal a growing recognition of cloud computing's potential in enhancing operational efficiency, cost management, and market competitiveness. However, this shift is tempered by challenges in leadership engagement, resource availability, and data security awareness. As cloud technology becomes central to enterprise strategy, the study emphasizes the need for targeted training, regulatory clarity, financial access, and cross-sector collaboration. These insights serve not only as a guide for MSMEs navigating the complexities of digital transformation, but also as a foundation for future strategic research in business technology adoption, particularly in developing regional economies.

**Keywords:** Cloud Computing, Strategic Adoption, MSMEs, Digital Transformation, Organizational Readiness, Competitive Strategy, Technology Integration

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## 1. INTRODUCTION

Cloud computing is essential for micro, small, and medium enterprises (MSMEs) as it enhances efficiency, reduces costs, and supports scalable

operations (Wu, 2024). It enables business model innovation and strategic adaptation in the digital economy (Adama & Okeke, 2024) while improving productivity and sustainability (Martínez-Peláez et al., 2023). Despite its benefits, adoption remains

hindered by limited resources and slow uptake (Patty & Yuhertiana, 2023). Successful implementation depends on organizational readiness, leadership commitment, and clear recognition of business value (Kusdiyanti et al., 2024). Overall, cloud technologies strengthen operational agility, competitiveness, and revenue growth for MSMEs (Sharma & Sharma, 2024; Xiao, 2025).

Cloud adoption among MSMEs in Nueva Ecija is shaped by both organizational and environmental factors that influence efficiency, competitiveness, and innovation. Leadership readiness and support are central to successful implementation, as top management commitment guides resource allocation and strategic direction (Hamzah et al., 2023). External pressures, such as competition and regulatory demands, also drive MSMEs to adopt cloud solutions to stay viable. Cloud computing offers cost efficiency, scalability, and improved resource management, enabling data-driven decisions and stronger competitive positioning (Martínez-Peláez et al., 2023). Overall, the interaction of internal capabilities and external pressures creates the conditions necessary for effective cloud adoption in the digital economy.

This study investigates the adoption landscape of cloud computing among MSMEs in Nueva Ecija by integrating established business strategy frameworks. The primary focus is on understanding how organizational factors such as leadership commitment and resource management interact with external pressures, including market dynamics and regulatory influences, to shape cloud computing practices. Research indicates that effective leadership is crucial for promoting technological adoption, as top management that recognizes the strategic importance of cloud solutions tends to drive higher engagement rates among their teams (Hamzah et al., 2023). Furthermore, the alignment of cloud adoption with broader organizational strategies can enhance operational efficiency, innovation capacity, and competitive advantage, ultimately leading to improved performance (Syairudin & Nabila, 2024). The literature emphasizes that while technical and economic aspects are prevalent in discussions around cloud technology, highlighting strategic alignment can reveal the nuanced drivers and barriers that influence real-world implementation among MSMEs (Martínez-Peláez et al., 2023).

The research objectives are threefold. First, to map the current state of cloud computing adoption among MSMEs and identify strategic enablers and inhibitors. Second, to analyze how these enterprises position cloud technology within their broader competitive strategies. Third, to propose a strategic model that MSMEs and stakeholders can use to guide more effective cloud adoption decisions. Employing a mixed-methods approach, the study combines quantitative data from enterprise surveys with qualitative insights from managerial interviews, producing a nuanced understanding of adoption behavior. This investigation underscores the relevance of digital transformation as a strategic imperative for MSMEs, particularly in resource-constrained environments. By contextualizing cloud computing within broader corporate strategy, the study offers a practical and theoretical

contribution to the discourse on innovation, competitiveness, and enterprise resilience.

The rest of the paper is structured as follows. Section 2 presents the review of related literature. Section 3 outlines the research methodology. Section 4 summarizes the findings. Section 5 offers a discussion and strategic implications. Section 6 concludes with recommendations for practitioners and future research directions.

## 2. LITERATURE REVIEW

### 2.1. Strategic technology adoption in micro, small, and medium enterprises

Cloud computing enhances MSME competitiveness and sustainability by providing scalable, cost-efficient information technology (IT) resources that reduce infrastructure burdens (Sutrisno et al., 2024). MSMEs adopt cloud technologies for benefits such as lower costs, higher productivity, and better customer engagement, though concerns about security, skills gaps, and organizational readiness remain (Hendrawan et al., 2024). Leadership is central to successful adoption, as active top-management involvement strengthens digital strategy, resource allocation, and the development of a supportive digital culture (Sharma & Sharma, 2024). When cloud technologies are strategically integrated, MSMEs gain greater agility, wider market reach, and improved service delivery, supporting long-term sustainable growth (Athia et al., 2023).

### 2.2. Cloud computing as a competitive strategy

Cloud computing is now central to MSME digital strategy, offering flexibility and cost efficiency that support proactive, data-driven decision-making (Syairudin & Nabila, 2024). It strengthens competitiveness by enabling advanced analytics, collaboration, and new business models such as remote operations and faster product development (Zhang et al., 2024). However, MSMEs must address risks like vendor lock-in, data migration issues, and the strategic consequences of outsourcing IT functions (Wu, 2024). Aligning cloud capabilities with business goals and managing these risks effectively is essential for maximizing value (Lei & Wang, 2023). Overall, successful cloud adoption enhances MSME resilience and long-term viability in the digital landscape (Sutrisno et al., 2024).

### 2.3. Organizational readiness and environmental pressures

MSME readiness for cloud adoption depends on internal and external factors. Internally, firms must assess IT infrastructure, staff skills, and financial capacity, as legacy systems and limited expertise can impede adoption (Nanos & Stafyla, 2024). Organizational culture that supports flexibility and innovation further strengthens readiness (Jidon et al., 2023), while aligned governance and strategic processes enhance technological transformation (Jacoba et al., 2024). Externally, regulatory support and clear data protection policies influence trust in cloud use, whereas weak governance creates hesitation (Purnomo et al., 2024). Customer

demands for faster, accessible services also push MSMEs toward cloud adoption (Purwantini et al., 2024). Crisis conditions and economic disruptions accelerate digital shifts, mirroring patterns seen in institutional service continuity (Adi et al., 2023). Together, these factors highlight the need to evaluate both internal capabilities and external pressures to guide effective cloud adoption.

#### 2.4. Conceptual framework: Strategic adoption model

This study proposes a conceptual framework that integrates organizational and environmental factors to explain cloud adoption as a strategic, not merely technical, decision. Internally, top management support, technological compatibility, financial readiness, and an innovation-driven culture enable effective cloud integration (Samira et al., 2024). Externally, regulatory clarity, market pressure, and competitive threats shape adoption, while data privacy uncertainties in regions with weak cloud governance can discourage MSMEs (Gyau et al., 2023). Rising customer expectations, however, make cloud use increasingly essential for competitiveness (Samira et al., 2024). The framework emphasizes that the interaction of internal capabilities and external pressures drives adoption and creates a feedback loop in which post-adoption outcomes influence future strategic choices (Kuzior et al., 2024). Ultimately, cloud computing becomes a foundation for sustained strategic growth and continuous digital transformation in MSMEs (Khoirunnisa & Sumadi, 2023).

### 3. METHODOLOGY

This study adopted a mixed-methods research design to explore the strategic factors influencing cloud computing adoption among MSMEs in Nueva Ecija. By combining quantitative data with qualitative insights, the research aimed to capture both measurable patterns and nuanced perspectives that inform strategic decision-making in digital transformation.

#### 3.1. Research design

A mixed-methods approach was employed to examine both internal organizational readiness and external environmental pressures influencing cloud adoption among MSMEs. The quantitative component utilized a structured survey to measure key constructs, including perceived benefits, barriers, leadership involvement, and strategic alignment. Complementing this, semi-structured interviews with selected decision-makers provided deeper insights into managerial perspectives and practical experiences related to cloud technology adoption. This triangulation strengthened the validity of findings and enabled a holistic understanding of strategic adoption behavior.

While this study focused on an exploratory mixed-methods design, alternative methodologies may be valuable for future work. Larger quantitative studies using advanced statistical techniques (e.g., structural equation modeling) could enhance generalizability and evaluate causal relationships. Qualitative case studies may reveal deeper organizational dynamics, and longitudinal research

could capture evolving adoption decisions over time. Intervention-based approaches, such as piloting training or support programs, could directly assess strategies to improve readiness. These directions were not pursued due to time and resource constraints, but provide important opportunities for continued research.

#### 3.2. Instrument development

The survey questionnaire was constructed using established constructs in the domains of technology adoption, strategic alignment, and organizational capability. Each section of the questionnaire corresponded to one or more thematic factors relevant to cloud computing adoption, such as cost efficiency, operational flexibility, data security, IT compatibility, and leadership support. Respondents were asked to rate their agreement on a five-point Likert scale, enabling a standardized measurement of perceptions and readiness levels across enterprises. The interview guide, on the other hand, included open-ended questions that allowed participants to elaborate on specific adoption experiences, challenges encountered, and strategic considerations that influenced their decisions. This tool was essential in contextualizing the numerical trends observed in the survey data.

#### 3.3. Sampling and participants

Purposive sampling was used to select MSME owners, IT managers, and other personnel directly involved in technology-related decision-making, ensuring that responses reflected informed perspectives on digital strategy and operational priorities. A total of 51 MSMEs in Nueva Ecija participated in the survey, representing a range of industries including retail, services, manufacturing, healthcare, and finance. To deepen the analysis, interviews were conducted with ten key informants, comprising early adopters, hesitant adopters, and firms currently evaluating cloud technologies.

Although the sample size is modest and geographically limited, it is appropriate for an exploratory study focused on strategic insights rather than statistical generalization. Access to MSME decision-makers proved challenging due to time and operational constraints, further supporting the adequacy of the achieved sample for descriptive analysis. The representation of MSMEs across multiple sectors provides diverse viewpoints on adoption drivers and barriers. Nonetheless, restricted generalizability is acknowledged as a key study limitation, and future research with larger and more representative samples is recommended.

#### 3.4. Data collection procedure

Data collection was conducted over a three-month period using online platforms to ensure accessibility and convenience for participants. The survey was administered through digital forms, and invitations were sent via email and social media platforms commonly used by MSME stakeholders. Prior to participation, respondents were briefed on the study's objectives, assured of confidentiality, and informed that their responses would be used for academic purposes only.

Interview sessions were conducted virtually and lasted approximately 30 minutes each. Participants gave informed consent before the interviews commenced. All discussions were recorded with permission and later transcribed for analysis.

### 3.5. Data analysis

Survey responses were coded and analyzed using descriptive statistics, including frequencies, percentages, and cross-tabulations, to identify patterns related to cloud adoption, perceived benefits, organizational readiness, and competitive pressures. Comparisons were made across business sizes, industry sectors, and decision-maker roles to better understand contextual variation. Interview data were processed through thematic analysis to extract recurring themes that further explained the quantitative results. Integrating these two data sources provided a clearer understanding of how MSMEs in Nueva Ecija perceive and approach cloud computing as part of their strategic development.

Given the exploratory scope and modest sample size, the study does not seek to generalize findings or establish causal relationships. Instead, the results offer initial insights that may guide future research using larger, representative samples and advanced inferential techniques (e.g., regression analysis or structural equation modeling) to test and expand upon the relationships suggested in this study.

## 4. RESULTS

### 4.1. Profile of respondents

The demographic analysis showed a balanced representation of participants. Among the 51 respondents, 43.14% identified as male and 54.90% as female, while 1.96% opted not to disclose gender. In terms of age, 41.18% were between 18 and 25 years old, followed by 23.53% each in the 26-30 and 31-40 age brackets. A smaller proportion belonged to the 41-45 age group (3.92%) and above 45 years (7.84%). Educational attainment showed that 62.75% had completed a bachelor's degree, while 17.65% reached senior high school, 13.73% completed high school, and 5.88% held master's degrees. Regarding work experience, 43.14% had less than two years, 37.25% had 2-5 years, and fewer respondents had 6-10 years (11.76%) or more than 10 years (7.84%). Occupational roles varied: 33.33% identified as business owners, 54.90% as employees, 7.84% as IT managers, and 1.96% each as chief executive officers and branch managers.

### 4.2. Business classification

The participating MSMEs represented diverse industries. Retail dominated with 31.37%, followed by services (15.69%), manufacturing (9.80%), healthcare (9.80%), and banking/insurance (5.88%). Other sectors, such as government, crafts, and telecommunications, were present in smaller numbers. In terms of business size, 52.94% had 1-9 employees (micro), 43.14% had 10-99 (small), and 3.92% had 100-199 employees (medium).

### 4.3. Adoption status of cloud computing

Table 1 shows that the adoption stage varied among the enterprises. A total of 17.65% had already adopted cloud services, while 31.37% planned to adopt after evaluation. Another 33.33% were still in the evaluation phase, and 19.61% had evaluated but decided against adoption. Additionally, 21.57% were not considering adoption at the time of the survey. Looking ahead, 29.41% of MSMEs had already adopted cloud technologies, while 33.33% planned to adopt in more than three months. About 13.73% expected to adopt within 1-3 months, 1.96% within less than a month, and 21.57% had no future adoption plans.

**Table 1.** Distribution of micro, small, and medium enterprises across cloud adoption stages

<i>Adoption stage</i>	<i>Percentage (%)</i>
Already adopted	17.65
Planning after evaluation	31.37
Still evaluating	33.33
Evaluated but not adopted	19.61
Not considering	21.57

### 4.4. Key drivers of cloud adoption

Cost savings and flexibility emerged as the leading factors influencing cloud adoption, each cited by 39.22% of MSMEs. Access to advanced technology followed closely at 35.29%, while improved collaboration and productivity each accounted for 27.45%. These responses indicate that MSMEs perceive cloud computing not only as a tool for cutting costs but also as a strategic enabler of operational agility and digital capability.

**Table 2.** Key drivers of cloud adoption among micro, small, and medium enterprises

<i>Drivers</i>	<i>Percentage (%)</i>
Cost savings	39.22
Flexibility	39.22
Access to advanced technology	35.29
Improved collaboration	27.45
Productivity	27.45

### 4.5. Perceived benefits of cloud adoption

Respondents identified multiple benefits gained from using cloud services. Cost savings were reported by 50.98% of respondents, operational efficiency by 47.06%, and productivity improvements by 45.10%. Other benefits included enhanced data security (41.18%) and improved customer satisfaction (31.37%). Only 1.96% reported flexibility and scalability as a realized benefit, suggesting that while flexibility is a motivating factor, it may not always be an immediate post-adoption outcome.

### 4.6. Organizational readiness

MSMEs assessed their organizational capacity to adopt cloud computing through indicators of compatibility and skills. In terms of compatibility, 45.10% strongly agreed that their IT systems were cloud-ready, while 9.80% agreed. On operational compatibility, 49.02% strongly agreed, and 9.80% agreed. Regarding hardware and software alignment,

41.18% agreed, and 17.65% strongly agreed they were compatible. These responses suggest that a majority of MSMEs perceive their technical environment as supportive of cloud transition. In terms of personnel readiness, 45.10% agreed that their IT staff possessed the necessary skills, while 17.65% strongly agreed. A smaller group remained neutral (23.53%), and 13.73% strongly disagreed.

#### 4.7. Strategic leadership and support

Top management support was a significant factor in cloud adoption. 41.18% of MSMEs agreed, and 15.69% strongly agreed that leadership was committed to cloud deployment. Similarly, 43.14% agreed that top management demonstrated strong leadership in information systems strategy, while 17.65% strongly agreed. When asked about willingness to assume risks related to cloud adoption, 41.18% agreed, and 17.65% strongly agreed. However, a combined 15.69% either disagreed or strongly disagreed, indicating varied organizational risk tolerance.

#### 4.8. External pressures and industry competition

A majority of MSMEs believed cloud computing affected their competitiveness. Around 39.22% agreed, and 23.53% strongly agreed that it impacted their market position. Similarly, 41.18% agreed, and 13.73% strongly agreed, that they were concerned about falling behind competitors due to a lack of cloud adoption. These responses reflect an increasing awareness among MSMEs that cloud technology can serve as a strategic differentiator in a competitive landscape.

#### 4.9. Barriers to adoption

Among MSMEs not adopting cloud computing, the top barriers included lack of knowledge and expertise (43.14%), security and privacy concerns (41.18%), and concerns about data loss or downtime (31.37%). Additionally, 29.41% cited lack of funding, while 27.45% mentioned lack of internal resources to manage cloud solutions, as shown in Table 3. These results underscore the need for technical support, awareness campaigns, and strategic guidance to mitigate adoption hesitancy.

**Table 3.** Key barriers to cloud adoption among micro, small, and medium enterprises

<i>Barriers</i>	<i>Percentage (%)</i>
Lack of knowledge/Expertise	43.14
Security & privacy concerns	41.18
Data loss/Downtime	31.37
Lack of funding	29.41
Lack of internal resources	27.45

#### 4.10. Legal and regulatory considerations

Legal awareness regarding cloud services was generally favorable. A combined 54.91% agreed or strongly agreed that there was legal protection in place, though 31.37% remained neutral. Regarding the adequacy of existing laws and regulations, 56.87% believed they were sufficient, while 37.25% were neutral and 7.84% disagreed.

The relatively high level of neutrality suggests a need for improved information dissemination on legal frameworks that protect MSMEs using cloud-based systems.

## 5. DISCUSSION

### 5.1. Demographic and organizational composition

The diversity in age, gender, educational background, and roles among respondents in the study highlights the heterogeneity of MSMEs in Nueva Ecija. The predominance of respondents with a bachelor's degree suggests that education may facilitate the understanding and adoption of new technologies, though it is important to consider how additional factors, such as perceptions of risk and management support, also impact cloud adoption (Masa'deh et al., 2024). Moreover, the presence of various roles, including owners, managers, and employees, signifies multi-level decision-making processes in formulating cloud strategies, which can affect the adoption speed and effectiveness (Boyer & Kökösy, 2024). The variety of perspectives across management levels may lead to differing attitudes toward cloud adoption. For instance, top management may emphasize strategic benefits and innovation potential, whereas operational staff might focus on practical deployment challenges. This interplay can influence how quickly and effectively cloud computing initiatives are undertaken (Hidayat et al., 2023). Additionally, varying experiences and qualifications can create a more robust dialogue around technology adoption, fostering a culture of innovation that is critical for successfully integrating cloud solutions (Santos et al., 2024). Understanding this demographic diversity provides richer insights into how MSMEs may navigate digital transformation. Each segment's unique viewpoint can either enhance or hinder the organizational readiness necessary for effective cloud adoption, ultimately shaping the success of digital initiatives (Alotaibi, 2023).

### 5.2. Industry classification and enterprise size

The observed concentration of MSMEs in the retail and services sectors is indicative of their susceptibility to customer-driven innovation, which likely accounts for their heightened interest in cloud adoption. Smaller enterprises dominate this sample, emphasizing that micro and small businesses represent a primary target segment for cloud service providers. These businesses typically operate with limited IT resources, which makes cloud computing an especially attractive option due to its inherent scalability and low capital requirements (Imdadullah, 2023). The relatively lower presence of medium-sized firms in the sample may suggest an underrepresentation in cloud adoption or indicate that these businesses may be facing barriers that impede their engagement with cloud technologies. Factors, such as perceived complexity in implementation, financial constraints, and potential challenges associated with compliance in regulated sectors, could inhibit these firms from leveraging cloud solutions effectively (Megaro, 2024). Moreover, the interest of smaller MSMEs in cloud computing often correlates with their need for

innovative services that can enhance competitiveness, improve operational efficiency, and facilitate quick responsiveness to market demands. As cloud infrastructure reduces upfront capital expenditures and allows for agile scaling, it becomes a valuable resource for these enterprises seeking to innovate and adapt in a rapidly changing business environment (Ouma & Gitonga, 2023). Thus, while the predominance of smaller firms suggests a favorable landscape for cloud service providers, addressing the unique challenges faced by medium-sized enterprises could expand the overall adoption of cloud technology across the MSME spectrum.

### 5.3. Varying levels of adoption

The strategic adoption of cloud computing significantly impacts the competitiveness and sustainability of MSMEs in emerging economies. By offering scalable and on-demand resources, cloud solutions alleviate the financial burden of maintaining capital-intensive IT infrastructure, making them particularly beneficial for MSMEs operating under tight budgets (Sutrisno et al., 2024). Research indicates that MSMEs approach digital adoption uniquely, motivated by perceived benefits such as cost reductions, enhanced productivity, and improved customer engagement; however, these advantages are often tempered by concerns regarding data security, limited technical expertise, and inadequate organizational readiness (Hendrawan et al., 2024). Leadership plays a critical role in facilitating cloud adoption; when top management actively engages in digital strategy discussions, the likelihood of successful implementation is significantly increased (Alfarizi et al., 2024). Strategic leadership encompasses not only support for budget allocation but also the establishment of a vision, tolerance for risk, and cultivation of a digital culture within the organization. Such strategic behaviors determine whether MSMEs view cloud computing as a long-term investment or merely a tactical solution for immediate operational needs (Sharma & Sharma, 2024). While challenges persist in cloud adoption, those MSMEs that effectively integrate these technologies into their overall business strategy are better positioned to enhance agility, market reach, and service delivery, ultimately contributing to their sustainable growth (Gao et al., 2023).

### 5.4. Key strategic drivers

The pronounced focus on cost savings and operational flexibility as driving factors for cloud computing adoption among MSMEs reinforces the perception of cloud technology as a resource-optimizing tool. The case study presented by William and Mothukuri (2023) illustrates how cloud services not only facilitate significant cost reductions but also enhance collaboration, which aligns with MSMEs' aspirations for modernization and competitive advancement in today's digital landscape. The strong interest in advanced technologies, coupled with the pursuit of improved collaborative capabilities, suggests that the motivation behind these enterprises' cloud adoption extends beyond mere survival; they are actively seeking strategic value that can transform their operations. Moreover, the flexibility inherent in cloud solutions

allows MSMEs to adapt quickly to market demands. This adaptability has grown increasingly relevant, particularly in light of changing consumer behavior during and post-pandemic, as noted by Muhammad et al. (2023), who assert that digital services streamline operational costs and enhance service speed. However, varying levels of perception regarding cloud adoption, whether due to concerns over security, financial readiness, or technological compatibility, highlight that when MSMEs perceive clear strategic value, they are indeed more inclined to embrace technological innovations, as suggested by Chanda et al. (2024) and Yakubu et al. (2024). Both studies emphasize that organizational readiness and perceived security significantly influence the intention to adopt cloud computing. Thus, enabling a clearer understanding of cloud benefits and providing tailored support mechanisms may further encourage these enterprises to embark on their digital transformation journeys, aligning with their long-term business goals.

### 5.5. Realized benefits

The benefits of cloud computing, identified as cost efficiency, improved productivity, enhanced security, and increased customer satisfaction, attest to the tangible value it brings to MSMEs. These advantages contribute directly to enhancing business agility, streamlining operations, and improving market responsiveness (Ouma & Gitonga, 2023). The pronounced interest in advanced technologies suggests that MSMEs are driven not only by the need for survival but also by the potential for modernization and competitive advantage (Raj et al., 2024). This propensity indicates that organizations are likely to embrace technological innovation when they can clearly discern strategic value.

However, it is notable that scalability is not widely recognized as a realized benefit among MSMEs, which implies that many may not yet be fully leveraging the capabilities of cloud infrastructure. This underutilization could stem from limited application of advanced cloud features or a lack of investment in necessary training and system configuration (Díaz-Peláez et al., 2024). To fully realize the scalable benefits of cloud computing, training and education are crucial in guiding enterprises toward making the most of their cloud investments. As expressed by Ouma and Gitonga (2023), effective scalability management allows organizations to adjust their IT resources seamlessly to meet demand fluctuations, yet many MSMEs are still hesitant to tap into these capabilities. Addressing the gaps in awareness and utilization of scalable cloud resources could significantly enhance the overall adoption landscape for MSMEs, ultimately supporting their long-term strategies for growth and innovation (Aslam, 2023).

### 5.6. Organizational readiness and compatibility

The findings regarding IT compatibility underscore a generally positive internal environment for cloud integration among MSMEs. Many enterprises express confidence in their existing systems' compatibility with cloud services, indicating a reduced technical resistance to cloud adoption. This is supported by Tongsuksai et al. (2023), who emphasize that

compatibility is crucial for the adoption of enterprise resource planning (ERP) solutions, as it enables integration with existing technologies and streamlines processes. However, while a significant portion of enterprises believes their IT staff possess the necessary skills for implementation, there is also a notable proportion that remains neutral or disagrees with this assertion. This divergence suggests that although a foundational readiness for cloud computing exists within these organizations, technical capability gaps persist. Hamzah et al. (2023) highlight that adequate IT competence is a critical factor influencing the successful adoption of cloud accounting in SMEs, reinforcing the need for targeted training to bridge these gaps. Additionally, Polyviou et al. (2023) argue that the successful integration of adopted cloud services with existing systems is essential for seamless implementation. Organizations that institutionalize cloud solutions in line with their current practices can avoid disruptions during the transition, further accentuating the necessity for advisory support and training initiatives. Providing targeted education and resources may help address identified competency gaps, facilitating smoother transitions to cloud platforms and maximizing benefits for MSMEs. While the outlook for cloud readiness in MSMEs is generally optimistic, it is crucial to address the remaining technical capability gaps through training and advisory support to ensure these enterprises fully capitalize on the advantages afforded by cloud computing.

### 5.7. Top management involvement

The findings regarding leadership engagement underscore its critical role as an enabler of cloud adoption in MSMEs. The willingness of top management to assume risks, champion strategic initiatives, and support digital transformation reflects a proactive business posture that is essential for successfully integrating cloud computing (Yakubu et al., 2024). Top management support is recognized as a significant determinant of cloud computing adoption across various organizational contexts, facilitating smoother transitions and broader acceptance of new technologies (Megaro, 2024). However, the presence of neutral and negative responses in the survey indicates that not all MSMEs benefit from robust leadership advocacy. Where leadership is hesitant or inadequately informed, digital initiatives may stall or suffer from improper execution, highlighting the importance of strengthening managerial awareness and commitment (Boyer & Kökösy, 2024). Internal organizational factors, particularly top management support, are decisive in the adoption of cloud technologies, underscoring the need for effective leadership engagement (Boyer & Kökösy, 2024). To institutionalize cloud computing as a core strategy, it is crucial for MSMEs to foster an environment where leadership is both supportive and informed. Enhancing leaders' understanding of cloud technologies and their implications can cultivate a culture of innovation and responsiveness. This proactive engagement from management can lead to more effective implementation of cloud solutions and ultimately drive competitive advantage (Longoni et al., 2023). Consequently, addressing gaps

in leadership commitment and providing tailored support through training and resources can significantly enhance the digital transformation efforts of MSMEs (Zhang & Huang, 2024).

### 5.8. Competitive pressures

The belief that cloud computing enhances competitiveness among MSMEs underscores a growing awareness of the importance of digital strategy within this sector. Many respondents expressed concern over the risk of falling behind competitors due to the delayed adoption of cloud technologies, reinforcing the view that such solutions are increasingly perceived as a competitive imperative rather than merely optional tools. This realization acts as a catalyst, urging hesitant businesses to reevaluate their digital strategies and consider adopting cloud solutions to maintain market relevance. The alignment of cloud technology with improved competitiveness is further supported by the work of Kaniawati et al. (2024), which emphasizes how strategic orientations can bolster competitive advantages among MSMEs. Their findings highlight that embracing digital tools like cloud computing enables businesses to enhance their operational efficiencies and responsiveness to market changes, thereby facilitating better customer engagement and retention. Moreover, the need for modernization and responsiveness in an evolving business landscape, intensified by the pandemic, significantly propels businesses toward cloud adoption. This trend aligns with findings from Purnomo et al. (2024), which note that increased digital presence and marketing strategies resultant from cloud adoption contribute to revenue growth and profitability in MSMEs. The insights gathered reflect an increasing recognition that adopting cloud technologies is essential for sustained competitiveness, urging MSMEs to embrace this shift to secure their place in a rapidly digitalizing market landscape (Purnomo et al., 2024).

### 5.9. Barriers to adoption

The barriers to cloud computing adoption identified security concerns, lack of expertise, limited resources, and insufficient understanding indicate not only a technological gap but also a strategic misalignment within MSMEs. These challenges suggest that businesses may either overestimate the risks associated with cloud adoption or underestimate the long-term value that such solutions can provide, as indicated in the analysis of cloud computing trends (Rahman & Joy, 2024). The presence of multiple barriers within a single firm signifies that the adoption challenges faced by MSMEs are multifaceted, necessitating tailored solutions that address specific needs (Ha, 2024). Moreover, the acknowledgment of these barriers aligns with findings from Ali and Maelah (2025), which emphasize the importance of understanding technological innovations for maintaining competitiveness. Their research highlights how technological advancements can facilitate improved operational efficiency and customer satisfaction, particularly when organizations recognize and address internal challenges hindering adoption (Ali & Maelah, 2025). To effectively mitigate these challenges, a coordinated effort involving

policymakers, service providers, and local business networks is essential. According to Rawashdeh et al. (2023), providing targeted support could enhance organizational preparedness and strategic planning, ensuring that MSMEs effectively navigate the complexities of cloud adoption (Rawashdeh et al., 2023). Ultimately, fostering a holistic approach can help bridge the gaps in expertise and resources, allowing MSMEs to fully leverage the benefits of cloud technologies as a critical component of their long-term strategy (Kovács et al., 2023). Addressing these barriers not only supports individual firms but also contributes to a more robust digital transformation landscape, empowering MSMEs to thrive in a competitive market environment (Wu et al., 2023).

### 5.10. Regulatory confidence and legal clarity

The varied responses on legal protection and regulatory support indicate that MSMEs possess only a moderate level of awareness and confidence in existing governance frameworks. While some respondents recognize that laws exist to safeguard cloud-based operations, many remain uncertain, which may contribute to hesitation in adopting cloud solutions, especially in data-sensitive sectors. This uncertainty is often linked to concerns over compliance, data breaches, and the complexity of legal requirements across jurisdictions (Vega et al., 2025; Santos et al., 2024).

Strengthening MSMEs' understanding of applicable regulations and compliance standards could reduce perceived risks and improve trust in cloud adoption. Prioritizing information security and implementing structured risk management practices are essential to fully benefit from cloud technologies (Oladoyinbo et al., 2023). Transparent security assurances from cloud service providers can further enhance user trust (Megaro, 2024). Likewise, differences in data protection regulations can hinder cloud migration if organizations lack clarity on their responsibilities (Santos et al., 2024). Providing MSMEs with guidance, training, and accessible support would foster greater confidence in transitioning to cloud solutions (Ajayi, 2023).

In the Philippine context, MSMEs operate under established regulatory safeguards such as the Data Privacy Act of 2012 (Republic Act No. 10173), which mandates accountability, breach reporting, and appropriate technical and organizational security measures, enforced by the National Privacy Commission. Furthermore, national initiatives, including the DICT Cloud First Policy and the National Cybersecurity Plan 2023-2028, demonstrate strong government support for cloud adoption and enhanced cybersecurity practices. However, this study reveals that MSMEs often have only limited awareness of these frameworks. As a result, regulation acts as both an enabler and

a constraint: it provides legal protection but also introduces compliance obligations that may be challenging for resource-constrained MSMEs to interpret and implement.

## 6. CONCLUSION

This study demonstrates that cloud computing serves as a strategic enabler for MSMEs in Nueva Ecija, supporting cost reduction, operational efficiency, and competitiveness in the digital economy. Adoption is primarily driven by perceived benefits such as cost savings, flexibility, and access to advanced technologies, while successful implementation depends strongly on organizational readiness and leadership commitment. These findings reinforce that cloud adoption is a strategic decision influenced not only by technical considerations but also by culture, resources, and risk tolerance within the enterprise. Despite the recognized benefits, cloud adoption remains inconsistent. Many MSMEs continue to experience barriers, including limited knowledge, security concerns, financial constraints, and insufficient technical capacity. These issues highlight the need for stronger support mechanisms to enable MSMEs to fully leverage cloud innovations. The study contributes to the literature by offering an evidence-based assessment of cloud adoption within a developing regional context and identifying measurable strategic constructs such as readiness, leadership support, and perceived risks that future research may refine and validate.

However, the findings must be interpreted with caution. The sample size of 51 MSMEs from a single province restricts generalizability, and the cross-sectional, self-reported data do not capture changes over time or actual performance outcomes. These limitations present opportunities for further investigation, including comparative studies across regions and sectors, longitudinal analyses of adoption behavior, and research incorporating objective performance metrics as well as evaluation of training or policy interventions. Practically, MSMEs are encouraged to view cloud computing as a long-term strategic investment supported by strong leadership and capability building. Policymakers, government agencies, and technology providers can help accelerate adoption by offering training programs, financial facilitation, and clearer guidance on cybersecurity and legal compliance. Strengthening institutional support and awareness will empower MSMEs to navigate digital transformation more effectively. Ultimately, when cloud computing is aligned with business strategy and supported by informed leadership, it can drive sustained innovation, operational resilience, and growth among MSMEs in emerging digital economies.

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