

Adoption of Cloud-Based Management Systems in Higher Education Institutions in Asia

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Abstract

Higher education institutions across Asia are undergoing significant digital transformation as they adopt cloud-based management systems to improve administrative efficiency and enhance learning outcomes. The COVID-19 pandemic accelerated this shift, forcing universities to transition from traditional on-premises systems to scalable, remote-accessible platforms. However, adoption rates remain uneven across the region, with developed economies demonstrating advanced integration while developing nations face persistent infrastructural and financial barriers. This study examined the adoption of cloud-based management systems in higher education institutions across Asia through a systematic literature review, analyzing factors influencing implementation, challenges encountered, and success patterns across diverse educational contexts. A systematic literature review was conducted, analyzing peer-reviewed academic articles, government reports, and institutional publications focusing on cloud computing adoption in Asian higher education contexts. Findings revealed significant disparities in adoption rates between developed economies like Japan, South Korea, and Singapore, which demonstrated advanced cloud integration, and developing nations including the Philippines, Pakistan, and Vietnam, where barriers persisted. Key success factors included institutional readiness, leadership support, and digital literacy, while primary barriers encompassed security concerns, financial constraints, and technical expertise limitations. Software as a Service solutions achieved the highest adoption rates. Sustainable cloud adoption necessitates holistic approaches addressing technological, organizational, and environmental factors while considering local contexts and institutional capacities.

Keywords: *Cloud Computing, Higher Education, Digital Transformation, Technology Adoption*

1.1 Introduction

Across Asia, higher education institutions (HEIs) are undergoing a significant digital transformation as they adopt cloud-based management systems (CBMS) to improve administrative efficiency, enhance learning outcomes, and ensure institutional resilience in an increasingly digital economy. Cloud computing has become a central driver of educational innovation, enabling universities to streamline resource allocation, reduce infrastructure costs, and support real-time collaboration among faculty and students (Ali, 2020; Bhardwaj et al., 2021). The COVID-19 pandemic accelerated this shift, forcing HEIs to transition from traditional on-premises systems to scalable, remote-accessible platforms that guarantee learning continuity and data accessibility (Al-Hajri et al., 2021; Han & Trimi, 2022). As a result, cloud adoption is no longer an option but a strategic imperative for HEIs seeking to remain competitive and future-ready in a post-pandemic educational landscape (Amron et al., 2022).

In the Asian context, the adoption of cloud computing in higher education has expanded rapidly but remains uneven across countries and institutions. While developed economies such as Japan, South Korea, and Singapore demonstrate advanced integration of cloud-based platforms, developing nations like the Philippines, Pakistan, and Vietnam continue to grapple with infrastructural, financial, and technical barriers (Alimboyong & Bucjan, 2021; Ahmed et al., 2023; Thach & Lai, 2021). Several studies indicate that the success of CBMS adoption depends on factors such as institutional readiness, leadership support, digital literacy, and perceived usefulness of technology (Almazroi et al., 2020; Amron et al., 2022). The Technology Readiness and Technology Acceptance frameworks have frequently been applied to explain adoption behavior among universities, emphasizing that both organizational culture and user attitude determine the success of cloud migration (Malkawi et al., 2023; Saleh et al., 2024).

Despite the clear potential of cloud systems to transform higher education, persistent challenges continue to hinder widespread implementation. These include concerns over cybersecurity, privacy, data localization, and integration with legacy systems, as well as limited training for academic and administrative staff (Naveed et al., 2021; Qashou et al., 2025). Moreover, disparities in ICT infrastructure and inconsistent government policies across Asian countries contribute to unequal adoption rates (Malkawi, 2024; Digital Government Authority, 2025). Institutions in resource-constrained environments often face budgetary limitations and unreliable internet connectivity, which slow the transition toward cloud-driven educational management (Al-Hajri et al., 2021). Addressing these challenges requires a holistic understanding of both technological and human factors shaping the adoption process.

Consequently, this study sought to examine the adoption of cloud-based management systems in higher education institutions across Asia, focusing on the technological, organizational, and environmental conditions that enable or constrain this transformation. By synthesizing evidence from multiple Asian contexts, the study aims to identify critical success factors and policy considerations for sustainable cloud integration within HEIs. In doing so, it contributes to ongoing scholarly discussions on digital innovation, education management, and the strategic modernization of universities in the knowledge economy (Ali, 2020; Amron et al., 2022; Digital Government Authority, 2025).

1.2 Statement of the problem

Despite the growing recognition of digital transformation as a critical enabler of operational efficiency and academic excellence, higher education institutions (HEIs) across Asia continue to face persistent challenges in adopting cloud-based management systems (CBMS). While cloud computing offers flexibility, scalability, and cost-effectiveness, its implementation within many Asian HEIs remains fragmented, inconsistent, and limited in scope (Ali, 2020; Al-Hajri et al., 2021). Recent studies show that universities in Asia acknowledge the strategic importance of CBMS in improving administrative coordination, data accessibility, and learning delivery, yet adoption rates remain significantly lower compared to Western institutions (Amron et al., 2022; Han & Trimi, 2022). This gap highlights that while the technological potential of cloud platforms is well established, institutional and contextual barriers continue to undermine their effective use in higher education.

The most pressing challenge lies in the widening digital divide between technologically advanced and resource-constrained institutions. Many universities in countries such as the Philippines, Vietnam, and Pakistan lack the financial capacity, infrastructure, and human resource readiness to integrate CBMS effectively into their operations (Alimboyong & Bucjan, 2021; Ahmed et al., 2023; Thach & Lai, 2021). Factors such as inadequate internet connectivity, limited cloud literacy among academic and administrative staff, and unclear institutional policies on digital transformation exacerbate the problem (Almazroi et al., 2020; Malkawi et al., 2023). Moreover, the absence of comprehensive national strategies to support cloud adoption in higher education has resulted in institutions implementing isolated systems without standardized frameworks for interoperability, data security, or cost optimization (Naveed et al., 2021; Malkawi, 2024).

Concerns over cybersecurity and data sovereignty further complicate adoption efforts. Universities express reluctance to fully migrate sensitive academic and administrative data to cloud environments due to fears of unauthorized access, regulatory non-compliance, and loss of institutional control (Saleh et al., 2024; Qashou et al., 2025). These security apprehensions are often compounded by inadequate technical expertise and weak policy support, leaving HEIs vulnerable to system inefficiencies and implementation failures (Digital Government Authority, 2025). Furthermore, empirical evidence indicates that institutional leaders often underestimate the organizational change management required for successful cloud integration, resulting in resistance among staff and inconsistent usage across departments (Amron et al., 2022; Ali, 2020).

The problem extends beyond mere technology adoption to include questions of strategic alignment, institutional readiness, and sustainability of digital transformation within higher education. Many Asian HEIs have implemented cloud technologies reactively—often as a short-term response to the COVID-19 pandemic—without embedding them in long-term institutional strategies for teaching, research, and administration (Han & Trimi, 2022; Al-Hajri et al., 2021). This reactive approach has produced fragmented systems that fail to deliver full value or support innovation across the educational ecosystem. Consequently, HEIs risk lagging behind global peers in digital maturity, academic competitiveness, and administrative efficiency. The central problem, therefore, is not the availability of cloud technologies but the absence of comprehensive frameworks and institutional capacities to guide their strategic, secure, and sustainable adoption across Asia's higher education landscape.

1.3 Research objective

To assess adoption of cloud-based management systems in higher education institutions in Asia.

2.1 Literature review

The adoption of cloud-based management systems in higher education has emerged as a critical area of research, particularly following the digital acceleration triggered by the COVID-19 pandemic. Cloud computing in educational contexts encompasses various service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), each offering distinct advantages for institutional operations (Ali, 2020). The literature consistently demonstrates that cloud technologies provide universities with enhanced scalability, reduced infrastructure costs, and improved accessibility to educational resources (Bhardwaj et al., 2021). Al-Hajri et al. (2021) emphasize that the pandemic served as a catalyst for cloud adoption, forcing institutions to rapidly transition from traditional on-premises systems to cloud-based alternatives to ensure educational continuity. This transformation has been particularly pronounced in Asia, where universities have leveraged cloud platforms to support remote learning, streamline administrative processes, and facilitate real-time collaboration among stakeholders (Han & Trimi, 2022). The strategic importance of cloud computing extends beyond operational efficiency to encompass institutional resilience and competitive advantage in an increasingly digitized educational landscape (Amron et al., 2022).

However, the literature reveals significant disparities in cloud adoption rates across different Asian countries and institutional contexts. Developed economies such as Japan, South Korea, and Singapore have demonstrated more advanced integration of cloud-based platforms compared to developing nations (Alimboyong & Bucjan, 2021). Ahmed et al. (2023) highlight that universities in countries like Pakistan face substantial infrastructural and financial barriers that impede effective cloud implementation. Similarly, Thach and Lai (2021) note that Vietnamese higher education institutions struggle with limited technical expertise and inadequate policy frameworks for cloud adoption. The Digital Government Authority (2025) emphasizes that these disparities are often exacerbated by inconsistent government support and varying levels of ICT infrastructure development across the region. Alimboyong and Bucjan (2021) specifically examine the challenges faced by state universities and colleges in the Philippines, identifying issues such as budget constraints, unreliable internet connectivity, and resistance to technological change as primary obstacles to cloud adoption. These findings suggest that while cloud computing offers universal benefits, its successful implementation requires careful consideration of local contexts and institutional capacities.

The theoretical foundations underlying cloud adoption in higher education are predominantly grounded in technology acceptance frameworks, with particular emphasis on the Technology Acceptance Model (TAM) and Technology Readiness Theory (TRT). Amron et al. (2022) extend the technology readiness theory to predict cloud computing acceptance in higher education institutions, demonstrating that perceived usefulness and ease of use significantly influence adoption decisions. Almazroi et al. (2020) apply similar theoretical constructs to understand student acceptance of cloud computing services, revealing that attitude toward technology and perceived behavioral control are critical determinants of usage intention. Malkawi et al. (2023) emphasize that organizational culture and leadership support play crucial roles in shaping technology acceptance among faculty and administrative staff. The literature suggests that successful cloud adoption requires alignment between technological capabilities and organizational readiness, with institutions needing to develop appropriate change management strategies to facilitate smooth transitions (Saleh et al., 2024). Furthermore, Naveed et al. (2021)

argue that service quality dimensions including reliability, responsiveness, and security significantly impact user satisfaction and continued usage of cloud-based educational systems.

Security and privacy concerns represent persistent themes throughout the cloud adoption literature, with many studies identifying these as primary barriers to widespread implementation. Qashou et al. (2025) conduct a qualitative investigation of factors influencing mobile cloud computing adoption, highlighting that data security apprehensions often outweigh perceived benefits among institutional decision-makers. The literature consistently demonstrates that universities express reluctance to migrate sensitive academic and administrative data to cloud environments due to fears of unauthorized access and regulatory non-compliance (Saleh et al., 2024). Malkawi (2024) provides a systematic review of cloud computing studies in Saudi Arabian higher education institutions, revealing that cybersecurity concerns are frequently cited as impediments to full cloud integration. These security apprehensions are often compounded by inadequate technical expertise and limited understanding of cloud security frameworks among institutional staff (Digital Government Authority, 2025). Naveed et al. (2021) argue that addressing these concerns requires comprehensive training programs and clear policy guidelines that outline security protocols and data protection measures for cloud-based educational systems.

The literature also reveals important insights regarding the implementation challenges and success factors associated with cloud adoption in Asian higher education contexts. Bhardwaj et al. (2021) examine e-learning adoption during the COVID-19 outbreak in Indian public universities, identifying that institutional support, faculty training, and student digital literacy are critical success factors for cloud-based educational platforms. Han and Trimi (2022) analyze cloud computing-based higher education platforms during the pandemic, emphasizing that successful implementation requires strategic planning, stakeholder engagement, and continuous evaluation of system performance. The literature suggests that many institutions have adopted cloud technologies reactively rather than as part of comprehensive digital transformation strategies, resulting in fragmented systems that fail to deliver optimal value (Al-Hajri et al., 2021). Malkawi et al. (2023) identify issues and challenges in cloud computing virtual learning environments, highlighting the need for standardized frameworks that ensure interoperability and data consistency across different cloud platforms. The Digital Government Authority (2025) provides practical guidance for effective integration of cloud computing in educational digital transformation, emphasizing that sustainable adoption requires holistic approaches that address technological, organizational, and human factors simultaneously.

2.3 Theoretical review

The theoretical foundation for understanding cloud-based management system adoption in higher education institutions is primarily anchored in technology acceptance and readiness frameworks. The Technology Acceptance Model (TAM), developed by Davis, remains a cornerstone theoretical lens for examining user acceptance of cloud technologies, with perceived usefulness and perceived ease of use serving as key determinants of adoption intention (Amron et al., 2022). Building upon TAM, the Technology Readiness Theory (TRT) provides additional insights into organizational and individual readiness for technology adoption, incorporating factors such as optimism, innovativeness, discomfort, and insecurity as psychological constructs that influence cloud computing acceptance (Almazroi et al., 2020). Amron et al. (2022) specifically extend the technology readiness theory to predict cloud computing acceptance in higher education institutions, demonstrating that institutional readiness significantly moderates the relationship between perceived benefits and actual adoption behavior. The integration of TAM and TRT

frameworks offers a comprehensive understanding of both cognitive and emotional factors that shape decision-making processes in cloud adoption contexts (Saleh et al., 2024). Furthermore, the Unified Theory of Acceptance and Use of Technology (UTAUT) has been increasingly applied to examine cloud adoption in educational settings, with performance expectancy, effort expectancy, social influence, and facilitating conditions serving as primary predictors of behavioral intention and usage behavior (Malkawi et al., 2023).

The organizational perspective on cloud adoption is effectively captured through the Technology-Organization-Environment (TOE) framework, which provides a holistic view of factors influencing institutional technology adoption decisions. The technological context encompasses factors such as cloud service quality, system compatibility, and security features, while the organizational context includes variables like institutional size, leadership support, and digital culture (Naveed et al., 2021). The environmental context considers external factors such as government policies, competitive pressure, and regulatory requirements that influence cloud adoption decisions (Digital Government Authority, 2025). Diffusion of Innovation Theory (DOT) further complements these frameworks by explaining how cloud technologies spread within and across higher education institutions, with relative advantage, compatibility, complexity, trialability, and observability serving as key innovation characteristics that determine adoption rates (Ahmed et al., 2023). The literature suggests that successful cloud adoption in Asian higher education contexts requires careful consideration of cultural factors, institutional hierarchies, and resource constraints that may not be adequately captured by Western-developed theoretical models (Thach & Lai, 2021). Consequently, researchers have increasingly called for context-specific theoretical adaptations that account for the unique challenges and opportunities present in Asian educational environments, including varying levels of technological infrastructure, diverse regulatory frameworks, and distinct organizational cultures that influence technology acceptance and implementation processes (Al-Hajri et al., 2021; Qashou et al., 2025).

3.1 Research methodology

This study employed a systematic literature review approach to examine the adoption of cloud-based management systems in higher education institutions across Asia. The methodology involved comprehensive analysis of peer-reviewed academic articles, government reports, and institutional publications focusing on cloud computing adoption in Asian educational contexts. Key databases and sources were systematically searched using relevant keywords related to cloud adoption, higher education, and Asian institutional contexts. The selected literature was critically analyzed to identify patterns, themes, and factors influencing cloud-based management system adoption across different Asian countries and institutional settings.

4.1 Results and findings

The systematic literature review reveals significant variations in cloud-based management system adoption rates across Asian higher education institutions, with developed economies demonstrating substantially higher implementation levels compared to developing nations. Analysis of the literature indicates that countries such as Japan, South Korea, and Singapore have achieved advanced integration of cloud platforms, with universities in these regions successfully implementing comprehensive cloud-based solutions for student information systems, learning management platforms, and administrative operations (Ali, 2020; Digital Government Authority, 2025). In contrast, institutions in developing countries including the Philippines, Pakistan, and Vietnam continue to face substantial barriers to cloud adoption, with studies showing adoption

rates remaining below 40% in many cases (Alimboyong & Bucjan, 2021; Ahmed et al., 2023; Thach & Lai, 2021). The COVID-19 pandemic served as a critical catalyst for cloud adoption across the region, with Al-Hajri et al. (2021) documenting accelerated implementation timelines as institutions were forced to rapidly transition to remote learning environments. However, this emergency-driven adoption often resulted in fragmented systems lacking strategic integration, with many universities implementing isolated cloud solutions without comprehensive digital transformation planning (Han & Trimi, 2022).

The literature identifies several critical factors that significantly influence successful cloud adoption in Asian higher education contexts. Institutional readiness emerges as a primary determinant, with Amron et al. (2022) demonstrating that universities with established digital infrastructure and leadership support achieve significantly higher adoption success rates. The role of perceived usefulness and ease of use, as predicted by technology acceptance theory, proves particularly relevant in educational settings, with faculty and administrative staff more likely to embrace cloud technologies when they perceive clear operational benefits (Almazroi et al., 2020; Saleh et al., 2024). Digital literacy among staff and students represents another crucial factor, with institutions demonstrating higher cloud adoption rates correlating with comprehensive technology training programs and digital skills development initiatives (Bhardwaj et al., 2021). Government support and policy frameworks also play pivotal roles, with countries providing clear regulatory guidelines and financial incentives for cloud adoption achieving more widespread implementation across their higher education sectors (Digital Government Authority, 2025). Additionally, the literature reveals that institutional size and financial capacity significantly impact adoption decisions, with larger, well-resourced universities more likely to implement comprehensive cloud-based management systems compared to smaller institutions facing budget constraints (Malkawi, 2024).

Security and privacy concerns consistently emerge as the most significant barriers to cloud adoption across Asian higher education institutions, with studies indicating that these factors often outweigh perceived benefits in institutional decision-making processes. Qashou et al. (2025) identify data sovereignty and regulatory compliance as primary concerns, particularly in countries with strict data localization requirements and unclear cloud governance frameworks. The literature reveals that many universities express reluctance to migrate sensitive academic records, research data, and personal information to cloud environments due to fears of unauthorized access and potential data breaches (Naveed et al., 2021; Saleh et al., 2024). Technical expertise limitations further compound security concerns, with institutions lacking qualified cloud security professionals struggling to implement appropriate safeguards and monitoring systems (Malkawi et al., 2023). Integration challenges with legacy systems represent another significant barrier, with many universities operating outdated administrative systems that prove difficult to connect with modern cloud platforms (Ahmed et al., 2023). Financial constraints, particularly in developing countries, create additional obstacles as institutions face difficulties justifying cloud migration costs against immediate operational needs (Alimboyong & Bucjan, 2021; Thach & Lai, 2021).

The analysis reveals distinct patterns in cloud service adoption preferences among Asian higher education institutions, with Software as a Service (SaaS) solutions achieving the highest implementation rates due to their lower technical requirements and immediate usability. Learning Management Systems (LMS) and student information systems represent the most commonly adopted cloud-based applications, with institutions prioritizing these platforms to support teaching and administrative functions (Han & Trimi, 2022; Al-Hajri et al., 2021). Email and collaboration

tools follow closely, with universities leveraging cloud-based communication platforms to facilitate faculty and student interaction (Bhardwaj et al., 2021). Infrastructure as a Service (IaaS) adoption remains limited primarily to larger, technologically advanced institutions with sufficient technical expertise to manage virtual server environments and storage solutions (Ali, 2020). The literature indicates that hybrid cloud models are increasingly popular among universities seeking to balance security concerns with operational flexibility, allowing institutions to maintain sensitive data on-premises while leveraging cloud platforms for less critical applications (Digital Government Authority, 2025). Platform as a Service (PaaS) adoption shows the lowest implementation rates, with most institutions lacking the technical capabilities required for application development and deployment on cloud platforms (Malkawi, 2024).

The findings demonstrate that successful cloud adoption in Asian higher education requires comprehensive change management strategies that address both technological and human factors. Institutions achieving high adoption success rates consistently demonstrate strong leadership commitment, with senior administrators actively promoting cloud initiatives and allocating sufficient resources for implementation and training (Amron et al., 2022; Saleh et al., 2024). The literature reveals that universities implementing phased adoption approaches, beginning with non-critical applications before migrating essential systems, achieve better outcomes compared to institutions attempting comprehensive migrations simultaneously (Naveed et al., 2021). Faculty and staff training programs emerge as critical success factors, with institutions providing ongoing professional development and technical support achieving higher user acceptance and system utilization rates (Almazroi et al., 2020; Malkawi et al., 2023). The analysis also indicates that universities establishing clear cloud governance policies, including data management protocols and security guidelines, experience fewer implementation challenges and achieve better long-term sustainability (Qashou et al., 2025). Furthermore, the literature suggests that institutions engaging in collaborative partnerships with other universities and technology vendors achieve more cost-effective implementations and access to specialized expertise that supports successful cloud adoption initiatives (Ahmed et al., 2023; Digital Government Authority, 2025).

5.1 Conclusions

The systematic review reveals that cloud-based management system adoption in Asian higher education institutions remains highly uneven, with significant disparities between developed and developing economies. While the COVID-19 pandemic accelerated cloud adoption across the region, successful implementation requires comprehensive strategies addressing technological, organizational, and environmental factors. Security concerns, financial constraints, and limited technical expertise emerge as primary barriers, particularly in resource-constrained institutions. The findings indicate that sustainable cloud adoption necessitates strong leadership support, phased implementation approaches, robust training programs, and clear governance frameworks tailored to local contexts and institutional capacities.

6.1 Recommendations

Asian higher education institutions should adopt phased cloud implementation strategies, beginning with non-critical applications before migrating essential systems to minimize risks and build organizational confidence. Governments must develop comprehensive policy frameworks supporting cloud adoption through financial incentives, regulatory clarity, and national digital infrastructure investments. Universities should prioritize faculty and staff training programs to address digital literacy gaps and establish dedicated cloud governance committees to oversee

security protocols and data management. Collaborative partnerships between institutions and technology vendors can facilitate cost-effective implementations and knowledge sharing. Finally, institutions must integrate cloud adoption into long-term strategic planning rather than pursuing reactive implementations to ensure sustainable digital transformation.

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