

Technology Integration and Administrative Efficiency in Philippine SUCs: A Systematic Review

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ABSTRACT

This systematic review synthesized evidence on how technology integration contributes to administrative efficiency in Philippine State Universities and Colleges (SUCs), with emphasis on technology management practices, digital transformation barriers, and innovation-oriented strategies. Guided by PRISMA 2020, the review identified 152 records from electronic databases and supplementary sources. After duplicate removal, title and abstract screening, full-text eligibility assessment, and quality appraisal, 39 studies were included in the final thematic synthesis. Eligible studies addressed technology integration, digital transformation, ICT adoption, e-governance, cloud computing, information systems, or administrative automation in SUCs and comparable higher education contexts. Findings indicate that digital systems support administrative efficiency by streamlining workflows, improving records access, reducing manual redundancy, strengthening reporting, enhancing service quality, and supporting data-informed decision-making. However, the magnitude of efficiency improvement was rarely quantified, as most studies reported perceived benefits, usability outcomes, readiness assessments, or qualitative evidence rather than pre- and post-implementation measures. Effective implementation depended on digital leadership, ICT planning, infrastructure readiness, staff competence, system interoperability, data governance, cybersecurity, user support, and continuous monitoring. Persistent barriers included limited funding, weak connectivity, insufficient technical personnel, low digital competence, resistance to change, fragmented systems, procurement constraints, and cybersecurity risks. The review proposes a technology management framework linking leadership, governance, infrastructure, human capacity, system integration, and innovation partnerships to measurable administrative performance. The study provides evidence for SUC administrators, ICT managers, and policymakers in designing sustainable, transparent, responsive, and accountable digital administrative systems.

Keywords: administrative efficiency; digital transformation; Philippine SUCs; systematic review; technology integration

INTRODUCTION

Digital transformation has become a strategic agenda in higher education as institutions are increasingly expected to provide responsive services, data-informed decisions, flexible academic support, and efficient institutional operations. It is no longer limited to online learning or the use of digital platforms; rather, it involves

redesigning governance systems, administrative processes, data management practices, workforce competencies, and institutional service delivery models. In higher education, meaningful digital transformation requires alignment among technology, organizational strategy, institutional culture, leadership, and stakeholder needs (Alenezi, 2023; Benavides et al., 2020; Farias-Gaytan et al., 2023; Mohamed Hashim et al., 2022).

In the Philippine context, State Universities and Colleges (SUCs) play a critical role in public higher education. As publicly funded institutions, SUCs perform extensive functions in instruction, research, extension, production, student services, records management, procurement, finance, human resource management, and quality assurance. Government reporting indicated that the Philippines had 1,977 higher education institutions as of January 2024, including 113 SUCs and 137 local universities and colleges (Presidential Communications Office, 2024). Given this scale and mandate, administrative efficiency in SUCs is a public-sector management concern linked to accountability, service quality, compliance, and institutional performance.

Administrative efficiency in SUCs refers to the institution's capacity to process transactions promptly, maintain accurate and accessible records, implement clear workflows, monitor resources, generate reliable reports, and deliver transparent services to stakeholders. As administrative demands increase due to enrollment growth, quality assurance requirements, public procurement rules, data privacy responsibilities, performance-based reporting, and evidence-based planning, paper-based and disconnected systems become less sustainable. Improving administrative efficiency therefore requires competent personnel, integrated systems, reliable information flows, standardized procedures, and strong leadership support.

Technology integration can support administrative efficiency through management information systems, student information systems, human resource information systems, financial platforms, document tracking systems, online portals, digital records, dashboards, cloud-based tools, and automated workflows. These technologies can reduce repetitive manual tasks, minimize errors, improve access to institutional data, standardize procedures, and strengthen evidence-based decision-making. Recent studies have linked digital transformation in higher education management with operational efficiency, adaptive management models, and improved administrative service delivery (Carmo et al., 2025; Liu et al., 2025). Philippine SUC-specific evidence also suggests practical benefits, as cloud computing adoption has been associated with perceived improvements in access and flexibility, although adoption has been constrained by slow internet connection and limited awareness (Alimboyong & Bucjan, 2021).

However, successful technology integration depends on effective technology management rather than software acquisition alone. SUCs need digital leadership, strategic ICT planning, infrastructure readiness, data governance, cybersecurity mechanisms, staff training, user support, system interoperability, and continuous monitoring and evaluation. Studies on higher education digital transformation consistently emphasize that leadership commitment, institutional coordination, resource allocation, and capability building are essential to successful implementation (Bisri et al., 2023; Deacon et al., 2023; Fernández et al., 2023; Mohamed Hashim et al., 2022).

Despite its potential benefits, technology integration in SUCs may be limited by inadequate ICT infrastructure, limited funding, insufficient technical personnel, low digital competence among users, resistance to change, fragmented legacy systems, cybersecurity concerns, procurement constraints, and weak digital policy implementation. Systematic reviews on digital transformation in higher education show that such barriers are multidimensional, involving environmental, strategic, organizational, technological, cultural, and people-related factors (Gkrimpizi et al., 2023; Singun, 2025). These constraints may prevent institutions from fully realizing efficiency gains such as faster processing, improved record accuracy, better service delivery, and stronger institutional transparency.

Although many studies discuss digital transformation, ICT adoption, and technology use in higher education, evidence on how technology integration improves administrative efficiency in Philippine SUCs remains fragmented. Existing literature often focuses on instructional technology, online learning, general ICT adoption, or isolated system implementations rather than on the systematic relationships among administrative systems, technology management practices, digital transformation barriers, innovation strategies, and measurable efficiency outcomes. This systematic review, therefore, synthesized available evidence on technology integration and administrative efficiency in Philippine SUCs and comparable higher education

contexts. The study is expected to guide administrators, ICT managers, policymakers, and researchers in designing technology-enabled administrative reforms that promote transparency, responsiveness, accountability, and innovation-driven public higher education.

OBJECTIVES OF THE STUDY

This systematic review aimed to synthesize evidence on technology integration and administrative efficiency in Philippine State Universities and Colleges. Specifically, it sought to:

- identify technology management practices reported in Philippine SUCs and comparable higher education institutions;
- examine administrative efficiency outcomes associated with technology integration;
- identify barriers to digital transformation in SUC administration;
- synthesize innovation strategies that support technology-enabled administrative modernization; and
- propose a technology management framework for improving administrative efficiency in Philippine SUCs.

METHODOLOGY

3.1 Research Design

This study employed a systematic literature review design to synthesize existing evidence on technology integration and administrative efficiency in Philippine SUCs. The review was reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020), which provides updated guidance for transparent reporting of systematic reviews, including study identification, screening, eligibility assessment, inclusion, and flow diagram documentation (Page et al., 2021).

3.2 Review Framework

The review questions and eligibility criteria were framed using the Population-Concept-Context (PCC) structure. The population covered Philippine SUCs and comparable public higher education institutions. The concept focused on technology integration, digital transformation, digital systems, technology management practices, administrative automation, and innovation strategies. The context was administrative efficiency, including records management, enrollment, finance, procurement, human resource management, document tracking, research administration, and institutional service delivery. The PCC structure was used because it helped clarify the scope of the review and organize broad evidence in higher education and institutional management contexts (Peters et al., 2020).

3.3 Information Sources and Search Strategy

Relevant literature was searched from major scholarly databases, including Scopus, Web of Science, ERIC, ScienceDirect, SpringerLink, Taylor & Francis Online, Emerald Insight, IEEE Xplore, ACM Digital Library, and Google Scholar. Supplementary searches were also conducted using Philippine institutional repositories, CHED-related publications, reference list checking, and other relevant academic sources. The search strategy followed the principles of PRISMA-S, which emphasizes transparent reporting of information sources, search strings, limits, search dates, and supplementary search methods (Rethlefsen et al., 2021).

The search used Boolean operators and keyword combinations related to technology integration, administrative efficiency, SUCs, and higher education. The core search string was adapted depending on database syntax: (*“technology integration” OR “digital transformation” OR “ICT adoption” OR digitalization OR automation OR “management information system” OR “e-governance” OR “digital administration”*) AND (*“administrative efficiency” OR “administrative performance” OR “operational efficiency” OR “service delivery” OR “process improvement” OR “institutional performance”*) AND (*“state universities and colleges” OR SUCs OR “public higher education institutions” OR “higher education institutions” OR university OR college*) AND (*Philippines OR Philippine*).

3.4 Eligibility Criteria

Studies were included if they focused on technology integration, digital transformation, ICT adoption, automation, management information systems, digital governance, cloud computing, e-governance, or related technologies in higher education administration. Studies were also included if they examined administrative efficiency, institutional service delivery, administrative performance, operational improvement, or technology management practices in SUCs or comparable higher education institutions. Eligible publications included peer-reviewed journal articles, conference papers, systematic reviews, empirical studies, case studies, and policy-oriented academic studies written in English.

Studies were excluded if they focused only on classroom technology, online learning, or instructional delivery without administrative relevance. Articles were also excluded if they were opinion papers, editorials, blogs, news articles, non-academic sources, duplicate records, inaccessible full-text documents, or studies with insufficient methodological information. Studies outside the selected review period were excluded unless they were considered foundational methodological or conceptual references.

3.5 Study Selection Process

The database and supplementary searches identified 152 records. Of these, 103 records were retrieved from electronic databases, while 49 records were obtained from supplementary sources, including reference list checking, Google Scholar searches, institutional repositories, and other relevant academic sources. After removing 56 duplicate records, 96 records remained for title and abstract screening.

During title and abstract screening, 49 records were excluded for not meeting the inclusion criteria. The excluded records were mainly unrelated to technology integration, administrative efficiency, Philippine SUCs, or comparable higher education administration. Several records also focused mainly on instructional technology, online learning, or general ICT adoption without a clear connection to administrative systems or institutional efficiency.

A total of 47 full-text articles were assessed for eligibility. Following full-text review, 8 articles were excluded because they lacked a direct focus on administrative efficiency, were primarily focused on instructional technology or online learning, were not situated in SUCs or comparable higher education institutions, provided insufficient methodological detail, lacked usable findings related to technology integration, or lacked complete full-text information. Thirty-nine (39) studies were included in the systematic review and thematic synthesis. The corrected selection flow ensured numerical consistency across the abstract, methodology, results, PRISMA diagram (Figure 1), and discussion sections. Table 1 shows the study selection, and Table 2 shows the reasons and number of published articles excluded.

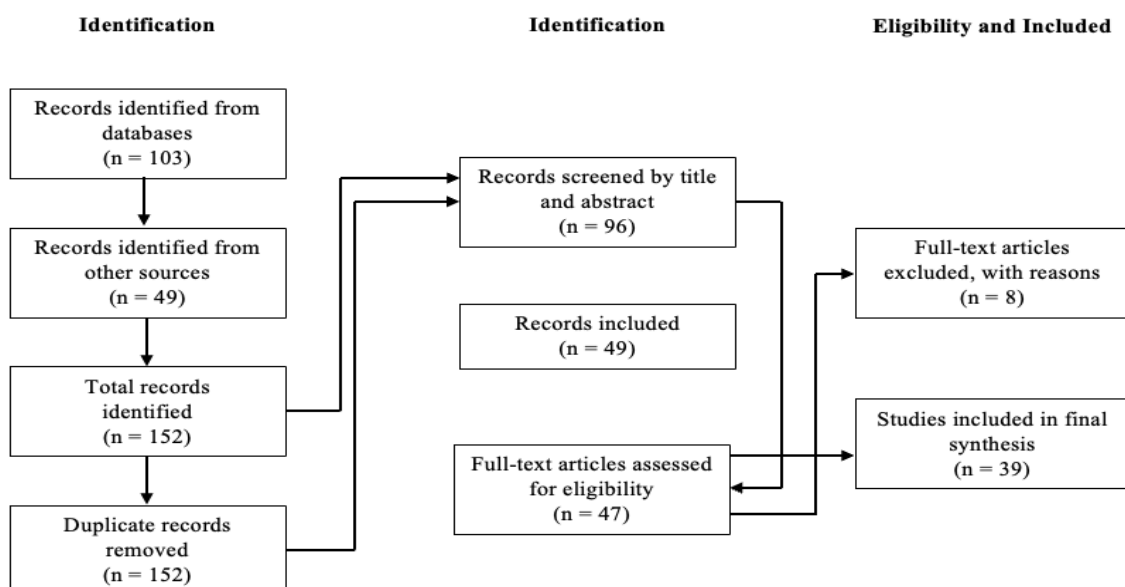


Figure 1. PRISMA 2020 Flow Diagram for Study Selection

Table 1. *Study Selection Summary*

Selection stage	Number of records/studies
Records identified from electronic databases	103
Records identified from supplementary sources	49
Total records identified	152
Duplicate records removed before screening	56
Records screened by title and abstract	96
Records excluded after title and abstract screening	49
Full-text articles assessed for eligibility	47
Full-text articles excluded with reasons	8
Studies included in final systematic synthesis	39

Table 2. *Reasons for Full-Text Exclusion*

Reason for exclusion	Number
Lack of direct administrative efficiency focus	2
Focused mainly on instructional technology or online learning	2
Not situated in SUCs or comparable higher education institutions	1
Insufficient methodological detail	1
No usable findings related to technology integration	1
Full text unavailable or incomplete	1
Total	8

3.6 Quality Appraisal

The methodological quality of the included studies was appraised using the Mixed Methods Appraisal Tool (MMAT) 2018. The MMAT was appropriate because the included body of evidence contained different study designs, including qualitative, quantitative, mixed-methods, descriptive, and case-based research. The appraisal considered the clarity of research questions, appropriateness of the study design, adequacy of data collection, relevance of the sampling or data sources, appropriateness of the analysis, coherence of the findings, and usefulness of the evidence for addressing the review objectives (Hong et al., 2018).

The appraisal results were not used to automatically exclude studies. Instead, they were used to interpret the strength and credibility of the evidence. This approach was appropriate because several Philippine SUC-specific studies provided contextually important evidence even when they reported perceived efficiency, usability, readiness, or service-quality outcomes rather than controlled measurements. Therefore, the synthesis distinguished between studies that reported quantifiable outcomes and those that provided qualitative, perceptual, or system-development evidence.

3.7 Data Extraction and Synthesis

A structured extraction matrix was used to collect bibliographic details, country or institutional context, study design, technology type, technology management practices, administrative efficiency indicators, digital transformation barriers, innovation strategies, key findings, limitations, and quality appraisal observations. The

extracted data were organized according to the major concepts of the review: technology integration, administrative efficiency, technology management practices, barriers to digital transformation, and innovation ecosystem strategies.

The review used thematic synthesis because the included studies varied in terms of research design, institutional setting, technology focus, and outcome indicators. Findings were coded and grouped into recurring themes, including technology management practices, types of technologies used in administration, administrative efficiency outcomes, barriers to digital transformation, innovation strategies, and research gaps. Thematic synthesis was appropriate because it allowed diverse evidence to be organized into descriptive and analytical themes (Thomas & Harden, 2008). A meta-analysis was not conducted because the included studies were heterogeneous and did not consistently report comparable quantitative effect sizes.

3.8 Ethical Considerations

Since the study was based on published and publicly accessible literature, it did not involve direct human participants. Ethical research practices were observed by properly citing sources, avoiding plagiarism, presenting findings objectively, and reporting the review process transparently. No data were fabricated, and interpretations were limited to the evidence obtained from the included studies.

RESULTS AND DISCUSSION

This section presents the synthesized results and discussion of the systematic review. The findings are organized according to the study objectives: technology management practices; administrative efficiency outcomes; barriers to digital transformation; innovation strategies for administrative modernization; and the proposed technology management framework. The synthesis combined Philippine SUC-specific evidence with broader higher education literature to clarify how digital systems, governance practices, institutional readiness, and innovation-oriented strategies shape administrative efficiency in public higher education.

4.1 Characteristics of the Literature Included in the Synthesis

The reviewed literature represented both local and international evidence. Philippine SUC-specific studies focused on cloud computing adoption, e-governance implementation, information technology systems integration, scholarship and grants management, and unified college admission systems (Alimboyong & Bucjan, 2021; Bordios et al., 2026; Francisco-Gabion, 2025; Ramizares, 2025; Remegio & Casquejo, 2025). These studies were important because they directly reflected administrative realities in SUCs, including connectivity issues, fragmented data systems, service-quality concerns, manual workflows, system security, and the need for standardized institutional processes.

The broader higher education literature provided conceptual and comparative support for interpreting the Philippine evidence. Systematic and review-based studies described digital transformation as an organization-wide process requiring leadership, strategy, infrastructure, governance, capacity building, and cultural readiness (Benavides et al., 2020; Carmo et al., 2025; Deacon et al., 2023; Fernández et al., 2023). Other reviews identified major barriers to digital transformation and examined the role of ICT in educational administration, particularly in relation to efficiency, communication, data-driven decisions, privacy, and digital divide concerns (Gkrimpizi et al., 2023; Liu et al., 2025; Singun, 2025).

4.2 Quality Appraisal Summary

The MMAT-informed appraisal indicated that the included evidence was useful but methodologically heterogeneous. Review-based studies generally provided broad conceptual coverage and clearer synthesis procedures, while local SUC-specific studies provided contextual relevance but often focused on single systems, perceived benefits, pilot usability, readiness, or service-quality outcomes. This pattern means that the evidence supports the relevance of technology integration for administrative modernization but remains limited in demonstrating precise causal magnitudes across SUCs.

The appraisal also showed that the strongest studies were those that clearly identified the administrative system examined, described implementation or assessment procedures, linked technology use to administrative outcomes, and discussed constraints such as infrastructure, digital competence, data security, or organizational readiness. Weaker evidence tended to describe technology adoption broadly without clear efficiency indicators, baseline measures, or post-implementation performance data. This limitation was considered when interpreting the results and when formulating the recommendations for future research. Table 3 shows the MMAT-informed quality appraisal summary.

Table 3. *MMAT-Informed Quality Appraisal Summary*

Appraisal focus	Observed pattern in the evidence base	Implication for interpretation
Clarity of research focus	Most included studies clearly addressed digital transformation, ICT adoption, e-governance, cloud computing, or information systems; fewer directly measured administrative efficiency.	FINDINGS support thematic interpretation but require caution when making causal claims.
Appropriateness of design	Designs varied across systematic reviews, case studies, system-development studies, descriptive studies, and institutional assessments.	Thematic synthesis was more appropriate than meta-analysis.
Outcome measurement	Many studies reported perceived efficiency, usability, readiness, service quality, or qualitative improvement rather than pre- and post-implementation metrics.	Magnitude of improvement should be treated as an evidence gap.
Contextual relevance	Philippine SUC-specific studies were highly relevant but often limited to single systems or selected institutions.	FINDINGS are useful for SUC planning but need validation through multi-institution empirical studies.
Reporting of barriers	Barriers such as infrastructure, funding, skills, fragmentation, policy gaps, and cybersecurity were consistently reported.	Barrier analysis is a strong component of the evidence base.

4.3 Technology Management Practices

The synthesis showed that technology integration in SUC administration required several recurring technology management practices: digital leadership, strategic ICT planning, infrastructure readiness, data governance, cybersecurity, staff training, user support, system interoperability, and monitoring and evaluation. In Philippine SUC-specific studies, these practices appeared in cloud adoption readiness, e-governance implementation, systems integration, scholarship management automation, and data-driven admissions. Alimboyong and Bucjan (2021) showed that cloud computing in SUCs was perceived as beneficial but constrained by connectivity and limited awareness. Ramizares (2025) emphasized the need for interoperability planning and change management, as fragmented systems and data silos weaken administrative integration. Remegio and Casquejo (2025) further showed that workflow design, user acceptance, reporting standards, and data protection were necessary in scholarship and grants management automation.

The broader higher education literature supported these local findings by identifying digital leadership, infrastructure, institutional strategy, organizational support, and professional development as conditions for sustainable technology integration. Deacon et al. (2023) argued that technology use becomes sustainable when leadership, infrastructure, strategy, and organizational support are aligned. Fernández et al. (2023) likewise emphasized that digital transformation initiatives should be embedded in institutional digital strategy rather than treated as isolated projects. Carmo et al. (2025) linked digital transformation in higher education management to critical success factors, including technology governance, leadership, competence, and operational alignment.

These findings indicate that administrative digitalization in SUCs cannot be reduced to installing a platform or purchasing an information system. A student information system, document tracking platform, e-governance portal, human resource information system, cloud service, or scholarship management system can improve administration only when supported by clear governance, reliable infrastructure, trained personnel, data standards, and monitoring mechanisms. Without these institutional supports, digital systems may reproduce inefficiencies, create parallel manual workarounds, or remain underutilized.

4.4 Administrative Efficiency Outcomes

The review found that technology integration was associated with several administrative efficiency outcomes, including faster transaction processing, reduced manual work, fewer errors, improved records access, standardized workflows, improved reporting, enhanced transparency, better service quality, and improved user satisfaction. Philippine SUC evidence showed that cloud computing, e-governance, integrated IT systems, scholarship management systems, and unified college admission systems could support administrative modernization when properly implemented (Alimboyong & Bucjan, 2021; Bordios et al., 2026; Francisco-Gabion, 2025; Ramizares, 2025; Remegio & Casquejo, 2025).

Specific functional-domain systems illustrated how technology could improve administrative processes. Remegio and Casquejo (2025) developed a Scholarship and Grants Management System to address delays, redundancies, decentralized processes, reporting gaps, and security concerns in scholarship administration. Bordios et al. (2026) proposed a unified college admission system for Philippine SUCs to standardize admissions, support equity and access, and improve data-driven governance. These examples suggest that efficiency gains may begin in specific administrative functions, such as scholarships or admissions, before being scaled into broader institutional information systems.

The reviewer's concern regarding the magnitude of efficiency improvement was addressed by distinguishing between reported efficiency outcomes and measurable efficiency metrics. The review found that most available studies did not quantify improvement using before-and-after measures such as processing time, operational costs, error rates, the number of manual steps, or user satisfaction scores. Instead, several studies reported perceived benefits, usability, service quality, readiness, or qualitative improvements. Thus, while the evidence supports a positive relationship between technology integration and administrative efficiency, the magnitude of improvement remains a major empirical gap. Table 4 shows the technology-specific administrative efficiency outcomes and strength.

Table 4. *Technology-Specific Administrative Efficiency Outcomes and Evidence Strength*

Technology or system area	Reported administrative efficiency contribution	Nature of evidence	Representative sources
Cloud computing in SUCs	Improved access, flexibility, and potential support for institutional operations; constrained by internet connectivity and awareness.	Perceived benefit and adoption issues; limited quantified efficiency magnitude.	Alimboyong & Bucjan, 2021
E-governance and e-administration	Improved service quality, administrative responsiveness, and public-facing service delivery.	Association with service-quality outcomes; limited pre- and post-implementation metrics.	Francisco-Gabion, 2025
IT systems integration	Reduced fragmentation, improved data access, and better inter-office coordination through interoperable systems.	Institutional assessment and strategic recommendation; limited direct magnitude measurement.	Ramizares, 2025

Scholarship and grants management system	Automation of application, evaluation, reporting, and tracking processes; reduced redundancy and administrative delay.	System-development and user-acceptance evidence; efficiency mainly inferred from workflow improvement.	Remegio & Casquejo, 2025
Unified college admission system	Standardized admissions, centralized data handling, and support for equity and access across SUCs.	Pilot usability and data-driven governance evidence; need for longitudinal performance measures.	Bordios et al., 2026
ICT in educational administration	Efficiency, communication improvement, and data-driven decision-making in educational administration.	Systematic scoping review; diverse evidence across contexts.	Liu et al., 2025
University e-service	Potential efficiency gains but also possible unintended inefficiencies when digital services lack policy controls.	Analytical evidence showing need for governance and rules.	Brdesee, 2021

This finding has practical implications for SUCs. Digital transformation plans should identify measurable administrative indicators before system implementation. These indicators may include average processing time, transaction volume, cost per transaction, number of manual steps eliminated, error rate, number of duplicate entries, report preparation time, service turnaround time, user satisfaction, and compliance reporting accuracy. Without these metrics, institutions may adopt digital systems without being able to determine whether the investment produced measurable administrative value.

4.5 Barriers to Digital Transformation

The synthesis identified several recurring barriers to digital transformation in SUC administration. These included limited ICT budget, weak connectivity, outdated infrastructure, low digital competence, insufficient technical personnel, resistance to change, fragmented legacy systems, data privacy concerns, cybersecurity risks, procurement delays, and weak policy implementation. Alimboyong and Bucjan (2021) showed that cloud computing adoption among Philippine SUCs was constrained by slow internet connections and a limited understanding of cloud computing. Ramizares (2025) similarly identified data silos, system incompatibilities, and resistance to change as challenges to systems integration in a local SUC.

The global higher education literature showed that these barriers were not isolated concerns but part of a broader multidimensional pattern. Gkrimpizi et al. (2023) classified digital transformation barriers into environmental, strategic, organizational, technological, people-related, and cultural categories. Singun (2025) identified barrier dimensions related to digital vision, strategy and policies, digital leadership and management, resources, competence, culture, stakeholder management, and digital ethics. These findings explain why technology investments may fail to produce efficiency gains when implementation conditions are weak.

For SUCs, the implication is that barrier diagnostics should precede major digital initiatives. Institutions should assess infrastructure readiness, user competence, process maturity, data quality, cybersecurity risk, procurement feasibility, budget capacity, and governance maturity before deploying systems. This is particularly important because SUCs differ in campus size, location, internet reliability, budget capacity, personnel complement, and technical readiness. A one-size-fits-all approach may deepen disparities and may result in underused or unsustainable systems.

4.6 Innovation Strategies for Administrative Modernization

The review identified several innovation strategies that may support technology-enabled administrative modernization in SUCs. These strategies included institutional digital transformation roadmaps, integrated

administrative systems architecture, cloud-readiness and connectivity improvements, digital governance structures, cybersecurity and data privacy protocols, capacity-building programs, user-centered design, monitoring and evaluation systems, and partnerships with government, industry, and technology providers.

Digital transformation roadmaps were identified as important for reducing fragmented technology initiatives. Benavides et al. (2020) and Fernández et al. (2023) emphasized that digital transformation should be planned as an organization-wide change process rather than a set of disconnected technology projects. For SUCs, a roadmap should define priority administrative systems, phased implementation timelines, responsible offices, funding sources, training requirements, cybersecurity safeguards, and evaluation indicators.

An integrated administrative systems architecture was also necessary to address data silos and system incompatibility. Ramizares (2025) and Liu et al. (2025) supported the importance of integration in improving information flow and decision-making. SUCs may need interoperability standards, application programming interfaces, centralized data governance, and common reporting structures to ensure that systems used by admissions, registrar, finance, human resources, procurement, research, and student services can communicate effectively.

Capacity building and user-centered design emerged as necessary strategies because digital systems succeed only when users understand, accept, and consistently use them. Training should target not only ICT personnel but also administrators, faculty-administrators, administrative staff, and frontline service personnel. Innovation ecosystem strategies may also include partnerships with government agencies, local government units, industry partners, software developers, research centers, and other HEIs. Such partnerships can support system development, infrastructure sharing, training, technology transfer, cybersecurity, and evidence-based evaluation.

4.7 Proposed Technology Management Framework

Based on the synthesis, administrative efficiency in Philippine SUCs may be understood through a technology management framework composed of five interacting components: inputs, integration processes, moderating barriers, efficiency outputs, and innovation ecosystem outcomes. The inputs include digital leadership, ICT planning, infrastructure readiness, budget support, staff competence, data governance, and cybersecurity. The integration processes include system selection, workflow redesign, user training, interoperability planning, data standardization, and monitoring. The moderating barriers include funding constraints, weak connectivity, low digital competence, fragmented systems, resistance to change, and policy limitations.

The expected efficiency outputs include faster transaction processing, reduced paperwork, fewer errors, improved records access, better reporting, greater transparency, enhanced service quality, and improved stakeholder satisfaction. The innovation ecosystem outcomes include sustainable digital governance, inter-office coordination, evidence-based planning, institutional partnerships, and continuous administrative improvement. The framework emphasizes that technology integration is not an isolated modernization activity but a strategic pathway for improving public higher education administration. Table 5 shows the proposed technology management framework for administrative efficiency in the Philippines SUCs.

Table 5. *Proposed Technology Management Framework for Administrative Efficiency in Philippine SUCs*

Framework component	Key elements	Administrative relevance
Inputs	Digital leadership, ICT planning, infrastructure, budget support, staff competence, data governance, cybersecurity	Define institutional capacity to initiate and sustain digital transformation.
Technology integration processes	System selection, workflow redesign, user training, interoperability, data standardization, system monitoring	Translate digital tools into functioning administrative processes.

Moderating barriers	Limited funding, weak connectivity, low digital competence, resistance, fragmented systems, procurement constraints, cybersecurity risks	Explain why technology adoption may not automatically improve efficiency.
Efficiency outputs	Faster processing, reduced paperwork, fewer errors, improved reporting, transparency, service quality, user satisfaction	Provide measurable indicators for evaluating digital administrative reforms.
Innovation ecosystem outcomes	Partnerships, shared services, digital governance, continuous improvement, evidence-based planning	Support sustainable, scalable, and innovation-driven administrative modernization.

4.8 Synthesis

Overall, the results support the view that technology integration contributes to administrative efficiency in Philippine SUCs when it is strategically governed, systematically implemented, and evaluated using meaningful indicators. The strongest pattern across the evidence is that administrative efficiency is produced by the interaction of technology, management practice, institutional readiness, and user adoption. Digital systems may accelerate transactions and improve records management, but these benefits depend on leadership, planning, infrastructure, user capacity, data governance, cybersecurity, and continuous evaluation.

The synthesis also suggests that SUCs should move from project-based digitalization toward coordinated digital transformation. Project-based digitalization occurs when individual offices adopt separate systems to solve immediate problems. Coordinated digital transformation occurs when digital systems are aligned with institutional strategy, integrated across offices, supported by governance mechanisms, and evaluated using performance indicators. The latter approach is more likely to produce sustainable administrative efficiency because it addresses workflow redesign, data standards, system interoperability, user training, and accountability.

IMPLICATIONS FOR SUC LEADERS, ICT MANAGERS, AND POLICYMAKERS

For SUC leaders, the findings emphasize the need to treat digital transformation as a governance priority linked to public service quality, transparency, and institutional performance. Leadership support is necessary for resource allocation, policy enforcement, user compliance, and inter-office coordination. For ICT managers, the findings highlight the need to move from isolated technical support toward strategic technology management. ICT units should participate in institutional planning, systems architecture, data governance, cybersecurity management, user training, and monitoring. They should also work closely with administrative offices to ensure that systems reflect real workflows and reporting requirements.

For policymakers, the findings suggest that national and institutional policies should support infrastructure investment, shared services, digital governance standards, cybersecurity compliance, and capacity-building programs for SUCs. Since SUCs operate under public mandates and resource constraints, digital transformation initiatives may require coordinated support from higher education agencies, ICT agencies, funding institutions, local partners, and industry collaborators.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This systematic review relied entirely on existing literature and did not generate new empirical data from Philippine SUCs. This limitation directly responds to the journal reviewer's observation that systematic reviews cannot substitute for field-based evidence. While the review synthesized available studies, the number of Philippine SUC-specific studies remained limited, and several focused on single systems or selected administrative domains. Therefore, the conclusions should be interpreted as a synthesis of available evidence rather than definitive causal proof of technology integration effects across all Philippine SUCs.

Another limitation is the heterogeneity of technologies, administrative functions, research designs, and outcome indicators across studies. Many studies reported perceived efficiency, usability, readiness, service

quality, or qualitative improvement rather than directly measured administrative performance. This made thematic synthesis more appropriate than meta-analysis and prevented estimation of pooled effect sizes. Future research should therefore use comparative case studies, longitudinal designs, and pre- and post-implementation evaluations involving SUCs with different levels of digital maturity.

Future studies should measure the impacts of specific technologies on administrative performance indicators, including processing time, operational costs, transaction volume, error rates, report generation time, service quality, user satisfaction, transparency, compliance accuracy, and workload reduction. Comparative studies across SUCs with high, moderate, and low digital maturity would provide deeper insight into the conditions that enable successful technology integration. Researchers should also examine how governance structures, ICT budgets, cybersecurity readiness, staff competence, and innovation partnerships influence the sustainability of administrative digital transformation.

CONCLUSION

The systematic review found that technology integration can improve administrative efficiency in Philippine SUCs by enhancing workflows, record access, reporting, transparency, service quality, and data-driven decision-making. However, these benefits depend on technology management practices, including digital leadership, strategic ICT planning, infrastructure readiness, data governance, cybersecurity, staff training, user support, interoperability, and monitoring. The review also found that barriers such as limited funding, weak connectivity, low digital competence, fragmented systems, resistance to change, privacy risks, procurement constraints, and weak policy implementation may prevent SUCs from fully realizing administrative efficiency gains.

The study concludes that technology integration should be treated as a strategic management and innovation ecosystem concern rather than a narrow ICT procurement activity. For Philippine SUCs, sustainable administrative modernization requires digital transformation roadmaps, integrated systems architecture, cloud readiness, capacity building, user-centered design, cybersecurity governance, service-quality monitoring, and strategic partnerships. The proposed technology management framework provides a basis for aligning digital tools, institutional capacity, administrative workflows, and innovation strategies to achieve more efficient, transparent, responsive, and accountable public higher education administration.

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