

Strategic Technology Management Framework for Educational Institutions with Limited Resources: A Case Study of a Local College in the Philippines

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Abstract: In an era of rapid technological advancement, educational institutions face the challenge of effectively integrating technology to enhance teaching, learning, and administrative processes. This research aims to propose a comprehensive technology management framework tailored for local colleges in the Philippines that operate under constraints of limited budgets and resources. The framework addresses the critical aspects of technology vision, strategic alignment, competitive advantage, customer-centric approach, and efficient resource utilization.

The first section delves into the establishment of a clear technology vision and mission, aligning them with the institution's management information systems (MIS), identifying competitive advantages, and formulating guiding principles that underscore technology utilization. Understanding the institution's customer base, defining the service portfolio, and assessing key metrics through providing valuable insights into current standing. Furthermore, a SWOT analysis identifies internal strengths and weaknesses along with external opportunities and threats. The subsequent section outlines the institution's strategic trajectory. It defines strategic initiatives for technology integration, fostering a culture of effective communication, and establishing governance initiatives to ensure the alignment of technology decisions with institutional goals. Operational initiatives are highlighted to emphasize the importance of translating strategies into tangible actions. The final section illustrates the practical implementation of the framework. It emphasizes the connection between the institution's overall strategy and specific technology initiatives, creating a roadmap for seamless execution. The plan implementation phase outlines the steps, responsibilities, and timelines required to achieve the outlined goals.

By addressing the unique challenges faced by local colleges in the Philippines with limited resources, this proposed technology management framework provides a structured approach to capitalize on available opportunities while mitigating challenges. Through the integration of technology into various aspects of education and administration, these institutions can enhance their competitiveness, foster innovation, and provide a superior educational experience to students and stakeholders alike. This research contributes to the broader discussion of technology management in educational contexts and offers practical insights for institutions worldwide facing similar resource constraints.

Keywords: *Strategic technology management, educational institutions, limited resources, technology vision, MIS alignment, competitive advantage, customer-centric approach, governance initiatives, operational efficiency, technology integration, strategic initiatives, implementation roadmap, local colleges, Philippines.*

I. Introduction

In the contemporary landscape of education, technology has emerged as a pivotal force, transforming traditional pedagogical methodologies and administrative processes. Educational institutions, particularly local colleges, are increasingly recognizing the potential of technology to enhance teaching and learning experiences, streamline administrative tasks, and bolster overall institutional effectiveness. However, this recognition often intersects with the daunting reality of limited budgets and resources, a challenge particularly pronounced in regions such as the Philippines.

The Philippines boasts a vibrant educational sector, with local colleges playing a crucial role in providing tertiary education to a diverse population. These institutions,

while committed to delivering quality education, often grapple with constraints that impede the seamless integration of technology. Scarce financial resources, inadequate technological infrastructure, and the need to balance immediate operational demands with long-term strategic goals create a complex milieu that requires thoughtful navigation.

In response to these challenges, a technology management framework tailored to the unique context of local colleges in the Philippines is imperative. This framework should not only address the incorporation of technology but also strategically align it with institutional objectives, ensuring a cost-effective and impactful approach to technology utilization.

This research endeavors to propose a holistic "Strategic Technology Management Framework" that addresses the multifaceted aspects of technology integration within the limitations of local colleges in the Philippines. By

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amalgamating insights from the fields of technology management, education, and strategic planning, this framework aims to provide a comprehensive roadmap for these institutions to maximize the benefits of technology while mitigating resource constraints.

II. Literature Review

The integration of technology in education has become a global imperative. In the Philippines, the Enhanced Basic Education Act of 2013, also known as the K-12 program, highlighted the significance of technology in enhancing the quality of education. Technology facilitates interactive learning, engagement, and the acquisition of 21st-century skills (DepEd, 2013)(CHED CMO 46). It enables institutions to offer flexible learning options, such as online and blended learning, which are crucial in times of crises like the COVID-19 pandemic (UNESCO, 2020).

Local colleges in the Philippines often grapple with limited financial resources, outdated infrastructure, and inadequate access to modern technologies (Esperanza, 2020). These constraints hinder their ability to effectively harness technology for educational advancement. Without a strategic approach to technology management, these institutions risk falling behind in an increasingly competitive education landscape.

Strategic Technology Management Frameworks

Several strategic technology management frameworks can guide local colleges in the Philippines. As cited by (Shahzad et al., 2021), the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) cited by (Zhao et al., 2021) offer insights into factors influencing the adoption of technology among educators and students. These models emphasize the importance of perceived ease of use and usefulness, which are critical in resource-constrained environments (Al-Fraihat et al., 2020) (Dwivedi et al., 2019).

Furthermore, the Technology, Pedagogy, and Content Knowledge (TPACK) framework (Greenhow et al., 2022) helps educators integrate technology effectively into their teaching practices. TPACK recognizes the interplay between technological knowledge, pedagogical knowledge, and content knowledge, highlighting the need for professional development (Ferdig et al., 2020).

Local colleges in the Philippines have made commendable efforts to address resource constraints through strategic technology management. A case study of a local college in the Philippines (Serrano & Macaraeg, 2018) demonstrated how a focus on faculty development, digital literacy programs, and partnerships with tech companies can lead to significant

improvements in technology integration.

A study by (Fernando Raguro et al., 2021) developed a framework for converting a conventional university into a smart university, which is more effective and efficient and has increased student and faculty involvement in achieving the common objective of improved learning.

Another case study conducted by the Commission on Higher Education (CHED) Philippines (2017) emphasized the importance of aligning technology initiatives with institutional goals. By strategically allocating resources and building a culture of innovation, local colleges can overcome challenges and enhance educational quality.

III. Materials and Methods

This section outlines the materials, methods, and data sources utilized in the comprehensive assessment of information and communication technology (ICT) resources and infrastructure at a local college in the Philippines. The study aimed to identify the hardware, software, network, and other ICT resources managed by the local college, with a focus on benchmarking and standards. The data collection process involved various categories, including customers, service portfolio, curriculum, instruction, assessment, robust infrastructure, and security measures.

Data Sources

Data for this assessment were collected from multiple sources, including:

- **Internal Documentation:** The local college's internal records, reports, and documents related to ICT resources, procurement, and maintenance.
- **Interviews:** Informal interviews with key personnel, including IT staff, faculty, and administrators, were conducted to gather insights and clarification on ICT resources and policies.
- **Observations:** On-site visits to the local college's facilities were made to observe the physical setup of ICT infrastructure and network connectivity.
- **Online Resources:** Information from the local college's official website, social media profiles, and other online resources was accessed to verify services and resources available to the community.
- **Hardware and Software Inventory:** An inventory of computing devices, peripherals, servers, and software applications was conducted to assess the extent and distribution of ICT resources.

Data Collection and Analysis

The assessment process followed a structured approach to collect and analyze data. Key categories assessed

include:

- **Customers:** The seven major customer categories (faculty, students, alumni, staff, administrators, partners, community) were identified, and their ICT needs and requirements were considered in the analysis.
- **Service Portfolio:** The local college's current and planned services and tools were examined, focusing on their role in supporting teaching, learning, and administration.
- **Curriculum, Instruction & Assessment:** The assessment considered the availability and utilization of various applications and policies related to curriculum delivery, instructional support, and assessment.
- **Robust Infrastructure:** Data on hardware, software, and networking components were collected and analyzed to evaluate the institution's technical capabilities.
- **Security, Disaster Recovery & Back-Up:** Measures and policies related to ICT security, disaster recovery, and backup were assessed to ensure data integrity and protection.
- **By the Numbers:** Data on the number of computing devices, peripherals, and servers, both by type and by year acquired, were collected to understand the ICT asset lifecycle.

- **Operating Systems:** Information about the operating systems used across various devices and servers was documented.
- **Office Automation Software:** The study examined the office automation software in use, particularly focusing on the office productivity suite.
- **Operational Systems:** Data on proprietary operational systems, development platforms, working environments, and maintenance costs were collected.
- **Network:** Details regarding the local area network (LAN), intranet, virtual private network (VPN), wide area network (WAN), and internet connectivity were assessed.

Data Validation, Ethical Considerations and Limitations

Data collected from various sources were cross-validated for accuracy and completeness. Inconsistencies and discrepancies were resolved through additional interviews and investigations. The assessment adhered to ethical standards and guidelines, ensuring the confidentiality and privacy of sensitive information. All personnel interviewed and surveyed were informed of the purpose of data collection and provided informed consent. This assessment is based on the data available up to the time of the study and may not capture subsequent changes or developments in the local college's ICT infrastructure.

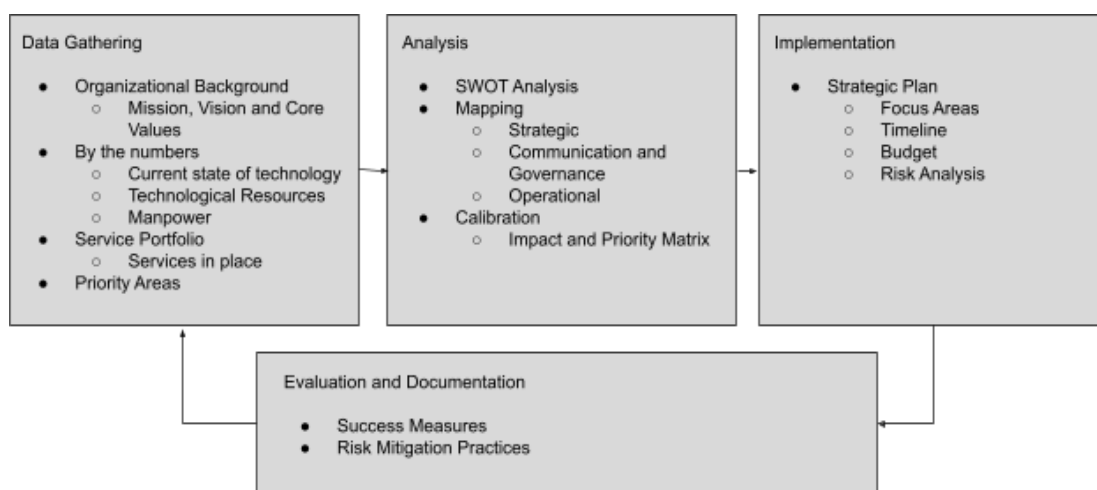


Fig 1. Research Framework

The research framework, tailored for colleges with limited resources, serves as a strategic compass for these institutions aiming to maximize their potential and adapt to changing educational landscapes. In an environment where resource allocation is critical, the data gathering component becomes particularly essential. Understanding the college's historical context,

educational mission, and available resources sets the stage for effective decision-making. Quantitative data, including financial metrics and student performance, aids in assessing the college's current standing. In an era of technological advancement, evaluating the institution's technology infrastructure is crucial for maintaining competitiveness.

However, the focus on limited resources is especially pertinent in this context. Analyzing manpower and services in place can help colleges identify areas where they can optimize their operations. By strategically allocating their limited resources, colleges can enhance the quality of education they offer. The analysis phase, including SWOT analysis and mapping, is vital for colleges to identify their strengths and weaknesses and streamline processes efficiently.

The implementation component is where colleges must make calculated decisions. Developing a strategic plan tailored to the institution's unique circumstances, establishing focus areas, and creating a realistic timeline and budget are vital steps. Risk analysis becomes particularly relevant, as colleges must manage risks effectively given their resource limitations.

The evaluation and documentation stage allows colleges to monitor progress and adapt strategies as needed. By defining success measures and regularly reviewing risk mitigation practices, colleges can ensure they remain agile and responsive to challenges. This framework acknowledges the constraints of colleges with limited resources while emphasizing the importance of strategic

planning and resource allocation to achieve their educational mission and vision effectively.

IV. Results and Analysis

The SWOT analysis (see fig 2) reveals the local college's significant strengths in its talented and communicative MIS staff, collaborative attitude, and reliable infrastructure, with demonstrated support from leadership. However, there are notable weaknesses, including incomplete online forms, communication challenges, insufficient IT staffing, and the absence of a public IT strategic plan. To harness opportunities, the local college can focus on enhancing MIS staff knowledge, sharing IT services, adopting virtualization, and aligning practices with industry standards. Nevertheless, the institution must contend with the constant fluctuation of technology priorities, change management during shared services transition, and the absence of standards in emerging technology fields as potential threats. Addressing these challenges and capitalizing on opportunities will be pivotal in optimizing the local college's technology management framework.

Strengths	Weaknesses
<ul style="list-style-type: none"> • Talented staff, knowledgeable in the support of technology • MIS staff who can explain things in layperson terms • Great collaborative attitude and many exemplary projects • Leadership within IT respectful of the skills of all members of the organization • Student services accessible from just about anywhere • Reliable basic infrastructure: email, phone, power and wireless • Demonstrated support from management for technology • Some baselines (for technologies, process, procedure, and success metrics) exist • Wireless access exist for all offices • Computers are refreshed regularly 	<ul style="list-style-type: none"> • Many forms are still not available online • Communication on IT timelines • Passing people from area to area and considering the job complete • Dedicated Quality Assurance does not exist • A few outstanding issues with network stability and accessibility • Lack of electronic workflow and forms • Insufficient IT staffing • Technology required for business continuity plans is not available • Lack of training sessions for Advanced Technologies • Lack of integrated applications • Lack of public IT strategic plan • Students unable to use some campus software at home
Opportunities	Threats
<ul style="list-style-type: none"> • Mobile growth • Improving MIS staff knowledge of emerging technologies • Sharing IT services with other departments • Virtualization of IT services • Alignment of processes, practices and services with industry standards and best practices 	<ul style="list-style-type: none"> • Constantly fluctuating priority areas • Change from in-house to shared services and employee perceptions • Lack of standards in emerging technology fields

Fig 2. SWOT Analysis

The output of the analysis for the local college is designed to address the institution's unique challenges and opportunities, particularly in the context of limited resources. The framework was developed by carefully analyzing the results of a SWOT analysis, which identified the institution's strengths, weaknesses, opportunities, and threats.

Table 1. Mapping of Findings

	Strategic Initiatives for Technology	Communication and Governance Initiatives	Operational Initiatives
S	- Talented staff, knowledgeable in technology support	- Proposed MIS Department ReOrganization	- IT Outsourcing Study
	- MIS staff who can explain in layperson terms	- Professional Development of MIS Personnel	- Infrastructure Development (IT DEV Perspective)
	- Great collaborative attitude and exemplary projects	- Leadership & Governance	- Targeted Operations Refinement
	- Reliable basic infrastructure	- Communication & Service	- Proposed Data Privacy Officer
	- Demonstrated support from management for technology	- Collaboration & Integration	- Improve Network Performance
	- Some baselines exist	- Sustainability	
	- Wireless access for all offices		
	- Computers are refreshed regularly		
W	- Many forms are not available online	- Proposed MIS Department ReOrganization	- Infrastructure Development (IT DEV Perspective)
	- Communication on IT timelines	- Professional Development of MIS Personnel	- Targeted Operations Refinement
	- Passing people from area to area without completing the job	- Leadership & Governance	- Proposed Data Privacy Officer
	- Lack of electronic workflows and forms	- Communication & Service	- Improve Network Performance
	- Insufficient IT staffing	- Collaboration & Integration	
	- Technology required for business continuity plans is unavailable	- Sustainability	
	- Lack of training sessions for Advanced Technologies		
	- Lack of integrated applications		
	- Lack of public IT strategic plan		
	- Students unable to use some campus software at home		
O	- Mobile growth	- Proposed MIS Department ReOrganization	- IT Outsourcing Study
	- Improving MIS staff knowledge of emerging technologies	- Professional Development of MIS Personnel	- Infrastructure Development (IT DEV Perspective)
	- Sharing IT services with other departments	- Leadership & Governance	- Targeted Operations Refinement
	- Virtualization of IT services	- Communication & Service	- Improve Network Performance
	- Alignment with industry standards and best practices	- Collaboration & Integration	
	- Constantly fluctuating priority areas	- Sustainability	
	- Change from in-house to shared services and employee perceptions		
- Lack of standards in emerging technology fields			

T	- N/A (No direct threats identified in the SWOT)	- Proposed MIS Department ReOrganization	- IT Outsourcing Study
		- Leadership & Governance	- Infrastructure Development (IT DEV Perspective)
		- Communication & Service	- Targeted Operations Refinement
		- Collaboration & Integration	- Proposed Data Privacy Officer
		- Sustainability	- Improve Network Performance

Strategic Initiatives for Technology

The local college is embarking on a strategic technology journey guided by a well-rounded set of initiatives. To leverage its strengths, such as a talented and collaborative staff, the local college is developing an on-campus Record Management System to streamline processes, enhance data privacy, and reduce costs. Additionally, recognizing the importance of information security, the local college is bolstering its governance, strategy, and risk management to safeguard against threats and align with industry standards. Embracing the mobile era, the local college plans to develop mobile applications, providing accessibility and convenience to its stakeholders. Moreover, aiming to transform into a "PaperLess" and "Secure" Campus, the local college will enhance its cybersecurity measures and reduce paper-based processes, aligning with sustainability goals. These strategic initiatives underscore the local college's commitment to innovation, data protection, and seamless user experiences.

Communication and Governance Initiatives

The local college's communication and governance initiatives are poised to reshape its technological landscape. Through the proposed MIS Department Reorganization, the institution aims to define roles and responsibilities, fostering a more structured approach to information security and technology development. Concurrently, a strong focus on leadership, professional development, and service quality will facilitate effective governance, fostering open communication and accountability. Collaboration and integration efforts seek to bridge data and technology, creating more meaningful services by involving various campus stakeholders. Ensuring the sustainability of these initiatives through regular assessments and updates underscores the local college's commitment to long-term success in technology management.

Operational Initiatives

In parallel, the local college is pursuing operational initiatives to bolster its technology infrastructure and

efficiency. The IT Outsourcing Study explores the feasibility of outsourcing IT infrastructure improvements, addressing operational challenges and resource constraints. Simultaneously, infrastructure development efforts aim to standardize and strengthen key components, ensuring robust support for emerging standards and technologies. The local college commitment to improving network performance is vital for uninterrupted operations and seamless connectivity. Furthermore, the appointment of a Data Privacy Officer aligns with legal requirements and reinforces data protection efforts. These operational initiatives empower the local college to efficiently manage its technology resources, optimize support, and adhere to regulatory compliance, positioning the institution for technological excellence and resilience.

Limited Resources

The framework addresses areas for improvement within the local college despite limited resources by optimizing existing strengths, fostering collaboration, streamlining processes, enhancing data privacy and security, and aligning with industry standards. Acknowledging resource constraints, the framework focuses on initiatives that maximize available resources, such as reorganizing the MIS Department, investing in staff development, and simplifying processes to reduce paper usage. Leveraging the local college's collaborative attitude, the framework promotes cooperation among departments, enabling innovative solutions with shared knowledge. Efforts to formalize information security governance and appoint a Data Protection Officer (DPO) align with legal requirements and bolster data protection. By adhering to industry standards, the local college can strategically manage technology initiatives despite resource limitations, ensuring efficient and effective operations.

Success measure of the proposed framework

The success of the strategic plan for technology at the local college can be measured through several key indicators. Firstly, the alignment of the mission and vision statements with budgeting processes reflects the

plan's effectiveness in guiding resource allocation. Flexibility in adapting to changing circumstances and leveraging the local college's strengths are indicative of the plan's resilience and strategic utilization of available resources. Furthermore, tangible progress on each strategic initiative within the plan demonstrates its practical implementation.

Ownership and understanding of the plan among MIS staff and the wider the local college community are vital factors for success. The plan's accessibility and visibility, coupled with its ability to motivate staff and align daily operations with long-term goals, signify its impact. Prioritization and alignment of strategies and tactics, as well as accountability measures, are crucial for ensuring that the plan's objectives are met.

Moreover, the plan's effectiveness is assessed through corrective actions taken promptly in response to any issues that arise. Quick and clear responses to questions about the plan's content and authority, responsibility, and tools provided to employees also contribute to its success. Finally, ongoing feedback processes, both from within the local college community and through assessment activities, inform updates and refinements to the plan, ensuring its continued relevance and effectiveness in achieving institutional goals.

V. Conclusion and Further Studies

This research has outlined a comprehensive strategic plan for technology at a local college in the Philippines that takes into account the institution's limited resources and aims to address areas of improvement. The framework presented aligns strategic initiatives for technology, communication and governance, and operational aspects with the local college's mission and vision. It is designed to optimize the use of available resources, enhance information security, facilitate a mobile and paperless campus, and improve overall governance and communication.

Despite the challenges posed by limited resources, the framework offers a structured approach to achieving long-term institutional goals. By focusing on measurable targets and fostering a culture of accountability and collaboration, the local college can gradually enhance its technological capabilities and services, ultimately benefiting its students, faculty, staff, and the wider community.

Further studies in this area can explore the actual implementation and outcomes of the strategic plan outlined in this research. Longitudinal studies can assess the progress made in achieving the plan's objectives over time and evaluate its impact on various stakeholders. Additionally, comparative studies can be conducted to analyze how similar educational institutions with limited

resources have addressed technology-related challenges and whether the strategies presented here can serve as a model for other institutions facing similar constraints. Furthermore, ongoing research can investigate emerging technologies and trends in education to ensure that the local college remains adaptable and innovative in its approach to technology management.

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