

SMART-Learning School Information System: A Design Science-Based Framework for IT Governance and Auditing in Senior High Schools

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ABSTRACT

This study addresses the persistent lack of structured, education-specific information technology (IT) governance and auditing frameworks within Senior High Schools (SHSs). While corporate entities heavily leverage mature frameworks such as COBIT 2019 to enforce accountability, maintain system stability, and guarantee security compliance, secondary education systems frequently manage fragmented implementations of Learner Information Systems (LIS) and Learning Management Systems (LMS) devoid of equivalent oversight. Guided by Design Science Research (DSR), this study develops and evaluates the SMART - Learning School Information System (SMART - LSIS) Framework. The framework provides a structured approach to IT governance and auditing, designed to enhance management, monitoring, and accountability of school information systems in Senior High Schools.

A purposive sample of 25 school ICT stakeholders - including ICT Coordinators, School Administrators, Registrars, and Support Staff - evaluated the institutionalized system infrastructure across five core domains. Descriptive statistical analysis revealed a Grand Mean of 4.05 (Agree), demonstrating strong stakeholder validation regarding the utility and structural composition of the artifact. However, Gap Analysis exposed a critical vulnerability: IT Auditing exhibited the lowest evaluation score ($M = 3.87$) and the highest discrepancy relative to the ideal standard ($Gap = 1.13$). These empirical insights substantiate the necessity of an integrated framework to consolidate school governance, system tracking, risk mitigation, and performance monitoring into a unified, continuous-improvement architecture.

Keywords: IT Governance, IT Auditing, School Information Systems, Learner Information Systems (LIS), Learning Management Systems (LMS), Educational ICT Compliance, Risk Management.

INTRODUCTION

The rapid evolution of educational technologies has turned the management of digital resources into an essential foundation for secondary schools globally (Timotheou et al., 2023). Educational institutions are aggressively implementing advanced Information and Communication Technology (ICT) tools-ranging from localized school network infrastructures to enterprise cloud platforms - to manage complex student information records and deliver virtual learning experiences that can translate to efficient operational processes. In the context of Senior High Schools (SHSs), this digital push is centered on core platforms: Learner Information Systems (LIS) used for administrative record-keeping and Learning Management Systems (LMS) dedicated to teaching and curriculum delivery.

However, many organizations utilize established IT governance frameworks such as COBIT 2019 to support risk management, information security, and strategic alignment, whereas educational institutions often face challenges in implementing structured governance mechanisms tailored to their operational environments (Wattimury & Faza, 2023; Tulus & Tanaamah, 2023). This framework gap leaves schools vulnerable to systemic

operational failures. Educational ICT infrastructures are frequently hit by system maintenance bugs, long periods of unexpected system downtime, and data synchronization lags during high-traffic enrollment seasons which significantly institutional performance.

Compounding these structural governance vulnerabilities is the weak integration of systematic IT auditing practices. As such, the regular implementation by academic entities on digital platforms resulted to compromised system security and monitoring. In addition, the school IT organization has limited system maintenance and monitoring that may lead to system vulnerabilities. Previous academic researches mostly focused on acceptability metrics and its applicability as learning tool utilizing the LMS. This leaves a significant gap in research regarding institutional system assurance, structural compliance, and integrated risk management within secondary school systems. Furthermore, few projects utilize Design Science Research (DSR) to build and deploy tailored IT governance blueprints specifically designed for the unique needs of school administrative ecosystems. Therefore, the current information management status fueled the necessity to develop and evaluate multi-layered Design Science Research framework be structured to effectively integrate IT governance, system auditing, data protection, and continuous performance tracking of the institution.

Statement of the Problem

To resolve these interconnected institutional gaps, this study designs, tests, and evaluates specialized governance and auditing framework for Senior High Schools. It addresses the following research questions:

1. What is the demographic distribution and professional profile of the school ICT management stakeholders participating in the study?
2. How do school ICT stakeholders evaluate the current school information system infrastructure across the domains of IT Governance, IT Auditing, Security and Risk Management, System Performance, and User Satisfaction?
3. What are the specific structural and operational gaps that exist between current school ICT management implementations and an ideal, fully optimized system standard?
4. How can a customized, multi-layered Design Science Research framework be structured to effectively integrate IT governance, system auditing, data protection, and continuous performance tracking within a Senior High School context?

Objectives of the Study

The primary purpose of this study is to design, develop, and evaluate the SMART - Learning School Information System (SMART-LSIS) Framework using a Design Science Research (DSR) approach to resolve the systemic IT governance and auditing vulnerabilities within Senior High School (SHS) environments.

Specifically, this study aims to achieve the following research objectives:

1. Profile the Technological Stakeholders: To determine the demographic and professional distribution of school ICT management stakeholders (ICT Coordinators, Administrators, Registrars, and Support Staff) currently managing institutional infrastructures;
2. Evaluate Current ICT Infrastructure: To measure stakeholder perceptions regarding the effectiveness of active school information system components across the domains of IT Governance, IT Auditing, Security and Risk Management, System Performance, and User Satisfaction;
3. Conduct Empirical Gap Analysis: To mathematically calculate and analyze the operational variance between the current state of school ICT management and an ideal optimized standard ($M = 5.00$) across all evaluated domains; and
4. Develop and Validate the SMART-LSIS Framework Artifact: To construct a customized, multi-layered IT governance and auditing blueprint tailored to the localized financial, structural, and administrative realities of secondary education ecosystems, verified through iterative expert validation.

Significance of the Study

Moving schools away from temporary tech fixes toward organized, secure systems is essential for modern education (Setyadi, 2023). This study provides a practical blueprint that helps resource-constrained schools manage their technology efficiently.

The outcomes of this research directly benefit the following groups:

School Administrators: Provides a clear decision-making guide to ensure technology investments match school goals while maximizing budget efficiency (Almantara, 2020; Harahap & Ikhwan, 2023).

School Registrars: Offers clear data-tracking methods to reduce entry errors, protect student records and maintain strict data privacy compliance (ESET, 2025)

ICT Coordinators & Support Staff: Shifts daily technical workflows from urgent troubleshooting to proactive maintenance, preventing platform crashes during busy grading and registration periods (Rosário & Dias, 2022; DeLone & McLean, 2003).

IT Auditors & Compliance Officers: Introduces a localized evaluation checklist to easily check system security, verify government compliance, and find structural gaps (Cooke, 2020; Metin et al. 2024).

Future Researchers: Fills a major research gap by focusing on secondary school tech infrastructure and system governance rather than just basic classroom software use (Hevner et al., 2021; Rosário & Dias, 2022).

Conceptual Framework

This study is anchored on the SMART-Learning School Information System (SMART-LSIS) Framework, which serves as the conceptual foundation for integrating IT governance, IT auditing, security and risk management, and performance monitoring within Senior High School information systems.

The framework follows the Input–Process–Output (IPO) model. The initial stage incorporates the institution’s ICT structures, namely: learner information and management systems, systems users, and network infrastructure. The system framework consists of quad-layered IT connectivity such as governance, auditing, security and risk management, and performance monitoring. Hence, these mechanisms function to ensure system efficiency relative to monitoring, protection, compliance, maintenance, and system performance assessment.

Moreover, the expected framework outputs are enhanced IT governance, information systems efficiency on audit processes, security management, and system reliability for effective decision-making among school officials. The framework provides a structured approach for strengthening the management, control, and sustainability of ICT resources in Senior High Schools.

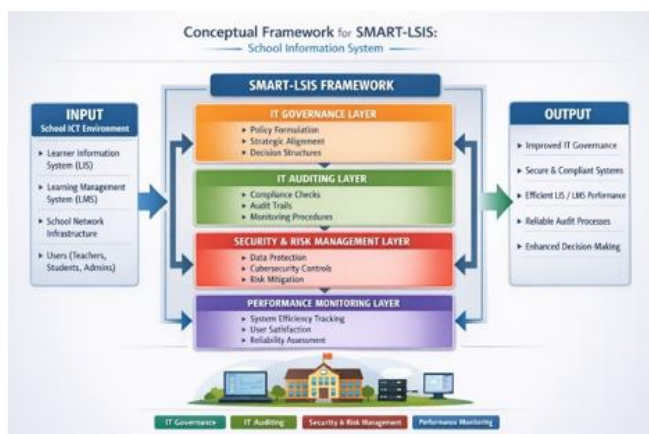


Figure 1. Smart -LSIS Conceptual Framework

REVIEW OF RELATED LITERATURE

Introduction

The rapid advancement of digital ecosystems has fundamentally altered the structural operations of contemporary academic institutions. In current education system senior high schools relied on technological platforms for teaching and learning deliveries and administrative necessities. These digital infrastructures for learners' information and management system have become the main business process framework for the educational institution.

However, this technological advancement adopted in education setting exposed schools to system vulnerabilities that compromise institutional integrity (Wibowo et al., 2025; ESET, 2025). To safeguard data and other information, efficient system management must be adopted to ensure effective IT administration and data protection. The literature was gathered to provide essential concepts and perspectives of the present endeavors, and arranged according to the construct of the study.

LITERATURE REVIEW

Digital Infrastructure and Structural Vulnerabilities of Senior High School Ecosystems

The deployment of Educational Information Systems (EIS) and Student Information Systems (SIS) has shifted from basic administrative database tools to centralized operational infrastructures managing online admissions, financial ledgers, and grading records (Lee et al., 2024; World Health Organization, 2020). While centralizing records within an EIS drastically minimizes manual data duplication errors, it simultaneously exposes secondary education networks to profound systemic vulnerabilities, including structural database crashes during high-volume grading weeks, unauthorized system access, and critical information leaks (Setyadi, 2023).

Congruently, Lee et al. (2026) investigated the vulnerabilities of digital service ecosystems which was an intricate combination of various platforms such as internal, external, and institutional factors. According to Basuki et al. (2025) digital infrastructure gap in school was evident, this includes limited internet access, deficient technological devices, digital illiteracy, and lacking technology competency training. Likewise, Supardi et al. (2024) stressed that limited ICT access in schools need to enhance system infrastructure. While, Badjuka et al. (2026) showed the need for digital integration of business processes as the conventional structure and practices resulted to delayed reports and responses, slower decision making and lack inter-departmental operability, and work process redundancy.

Senior high schools face ICT dilemmas that pose significant risks to management. Unlike universities and large corporations, SHSs often operate with smaller budgets and fewer skilled ICT staff. As a result, SHS technology systems usually work in a way fixing problems as they happen. This results in fragmented data storage, inconsistent tracking methods, and a general lack of coordination between departments.

Further, in the context of adopting information management system to enhance institutional efficiency, which promises improve business processes; however, system integration inherits digital infrastructure vulnerabilities and risks that organization needs to address, specifically on the technical and security aspects (Gulzar, 2023). The Philippines' Department of Education to improve business processes and governance adopted learners' information system; this brought immediate impact and streamlined processes and educational governance. However, challenges on IT infrastructure and technical aspects were found (Bete et al., 2025). On similar perspective, Villaseñor (2025) explored the different challenges in and dilemmas of digitalization in Philippines education where it reveals major findings highlighting internet inaccessibility and lacking a unified digital infrastructure ecosystem of different schools. Additionally, Enad and Balicoco (2023) explored the challenges of public secondary schools in the implementation of management information system, where risk of data loss and ineffective records management are some of the vulnerabilities discovered in the system adoption.

Moreover, Octave et al. (2024) investigated the vulnerabilities and threats brought by adopting digital infrastructure in the organization. These security vulnerabilities that can compromise confidential data and cause

business disruption, therefore, can negate the enhanced inter-connectivity and other digital business processes improvement. Thus, cybersecurity improvement or enhancement of information management system are highly recommended. Borja et al. (2025) stated that technological-based applications in Philippines' educational institutions to support operations can improve the system, but vulnerable such as data theft, service stoppage, uncompliant mechanism, etc. are some of the significant risks involve in the adoption of IT system.

Conclusively, implementation of information management systems and/or other IT-related system in educational institutions is accompanied by vulnerabilities and threats that can significantly affect the overall organization operation and interrelated business processes. As the focus is on senior high school where cases of local development of basic systems, thus, digital security incorporated in the IT governance is also a top priority.

IT Governance, System Performance, and User Satisfaction

To mitigate these operational risks, high school administrations must establish institutionalized Information Technology Governance (ITG) architectures. ITG defines the leadership frameworks, organizational workflows, and strategic control mechanisms that ensure technology deployments directly protect school assets and support academic objectives. In secondary education, structured IT governance directly correlates with optimized System Performance and elevated User Satisfaction. Fattah et al. (2021) pointed out that the effectiveness of IT governance is positively associated with the IT performance on aspect of structure mechanisms and process.

The study of Humaidi and Sarwan (2026) stressed that software and hardware units and reliability improvement of IT management system for infrastructure management, as well as incorporating staff competency to attain sustainability and effectiveness of IT-based business process system. Bianchi et al. (2021) developed and IT-based governance model based on design science research, wherein the results suggest positive evaluation for IT practices. Likewise, relative to user satisfaction which demographics are vital for IT implementation, Vaya-Arboledas et al. 2025 emphasized that demographics is one factor that influence IT governance as various literatures were systematically reviewed for insights in the IT governance development.

The need for responsive and flexible technology-based information management system in school has been highlighted during pandemic. The demand for continuing education prompted the government to adopt the information management system in order to cater the demand for quality education. This action supports the learning processes and helps administrators to provide techno-educational system for the institution (Syarwani & Syahrani, 2022). While Mulokonzi and Kitula (2023) stated that implementation of electronic-based system for governance in secondary schools shown a favorable operation despite of challenges encountered in its application.

According to Julianti et al. (2021) information management system influences the overall process of the educational institutions, and further analyzed the extent of system implementation with COBIT framework approach on educational services. The findings strengthen the business function of IT system implementation through effective IT governance, ensuring that performance is aligned to the goals of the organization. Mandeï et al. (2025) stated that management information system is crucial for effectiveness educational process of the institution.

When governance is absent, internal database workflows function without standardized policy controls, triggering severe system lag and downtime during enrollment windows (Almantara, 2020). Empirical research indicates that poor system performance directly damages user satisfaction among critical internal stakeholders - such as administrators, registrars, and support staff - who rely heavily on uninterrupted system access to fulfill daily compliance tasks (Dionicio, 2024). Therefore, a robust ITG framework cannot merely outline abstract administrative guidelines; it must establish concrete metrics that secure system availability, enhance database query speed, and streamline user interfaces to maximize day-to-day administrative efficacy.

Wattimury and Faza (2023) also found that COBIT-based IT governance significantly improves institutional ICT management, particularly in enhancing compliance and system monitoring. However, without proper auditing mechanisms, even well-designed systems fail to ensure transparency and accountability. On a larger scale, Karataş and Çakır (2024) laid out key components for IT governance and its accompanying system. These

key components for technology-based information management system revolves in framework, processes, and interlinked processes for an effective alignment to the organizational goals and objectives.

In lieu of the aforementioned premises, IT governance is a complex yet essential mechanisms for efficient business processes. Nonetheless, precautionary measures are needed to ensure its implementation as threats and vulnerabilities are just around the corner waiting for system errors to occur; hence effective IT monitoring and audit are vital for successful business processes or operations.

METHODOLOGY

Research Design

This study used the Design Science Research (DSR) methodology, which is essentially a problem – solving approach in research. The idea behind the DSR is to design, build, and test innovative solutions as artifacts that align with organizational challenges while also adding new knowledge to the field of information system. Likewise, a quantitative descriptive approach was employed to describe the key dimensions of ICT governance and information systems performance, specifically: IT Governance, IT Auditing, Security and Risk Management, System Performance, and User Satisfaction.

According to Peffers et al. (2020), DSR follows a clear structured process that starts with identifying a problem, defining objectives, designing and developing a solution, demonstrating how it works, evaluating its effectiveness and communicating with the results. This iterative cycle ensures that the artifact is both practical and scientifically validated.

In addition, Hevner (2021) points out that DSR plays a crucial role in bringing theory and practice. The science duality addresses the effective application of the scientific method as well as the advance of knowledge from the research project.

Despite the widespread adoption of Learner Information System (LIS) and Learning Management System (LMS) in educational institutions, there is still a lack of structured and integrated IT governance and auditing frameworks specifically designed for senior high school information system. To address the gap, this study developed the SMART – Learning Information System (SMART – LSIS) Framework as a comprehensive educational IT governance artifact. The framework integrates five major components that are used to collectively strengthen schools' ICT management, namely IT governance, IT auditing, security and risk management, system performance monitoring and continuous improvement mechanisms.

The six stage Design Science Research Process (DSRP) was utilized as a framework that continues to be widely applied and validated in recent design science studies by Peffers et al. (2020). The following phases guided the development and evaluation of the study.

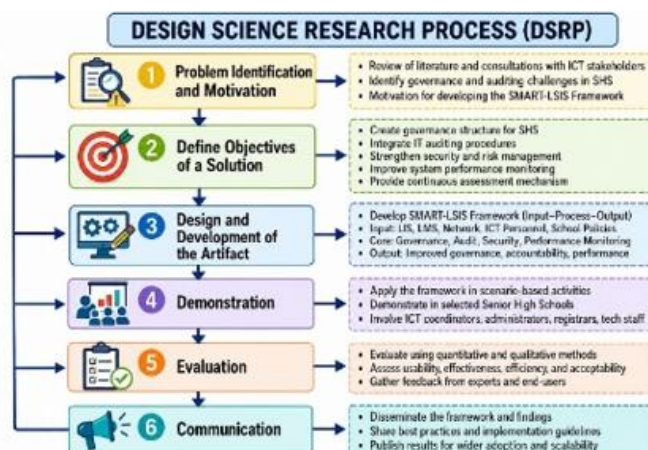


Figure 2. Design Science Research Phases

Phase 1: Problem Identification and Motivation

The researcher conducted a review of related literature and consultation with the ICT stakeholders and the registrars to identify governance and auditing challenges in senior high schools. Common issues identified from different schools are lack of structured IT governance policies, limited audit trail monitoring, inconsistent security assessment practices, absence of continuous performance monitoring and lack of school specific governance frameworks. These problems motivated the development of the SMART - LSIS Framework.

Phase 2: Define Objective of a Solution

Based on the identified problems encountered by the stakeholders, the study established the design objectives: create a governance structure tailored for senior high schools, integrate IT auditing procedures into daily operations, strengthen security and risk management practices, improve system performance monitoring and provide a continuous assessment mechanism for institutional ICT management.

Phase 3: Design and Development of the Artifact

This study used the iterative design of the SMART – LSIS Framework using the Input – Process – Output (IPO). The Input Layer consists of Learner Information System (LIS), Learning Management System (LMS), School Network Infrastructure and ICT Personnel. The Core Governance Layer consists of Governance Management, Audit Management, Security and Risk Management and Performance Monitoring. The Output Player consists of the Improved ICT Governance, Enhance Accountability, Better System Performance, Increased User Satisfaction and Sustainable ICT Operations. This framework was modelled using an Input – Process – Output (IPO) structure and aligned with the principles of COBIT 2019 and Information Systems Success Theory.

The figure below shows the developed

Phase 4: Demonstration

The proposed framework was demonstrated through scenario-based application in all senior high schools with the ICT coordinators, registrars and school principals. The participants examined on how the SMART – LSIS Framework could be applied to user account monitoring, audit trail management, data privacy compliance, system maintenance activities and performance reporting.

Phase 5: Evaluation

The artifact was evaluated through expert validation and stakeholders' assessment. Evaluation focused on relevance, completeness, usability, applicability and organizational fit. A structured evaluation instrument using the five – point Likert Scale in the five domains namely, IT Governance, IT Auditing, Security and Risk Management, System Performance and User Satisfaction.

Phase 6: Communication and Refinement

The final phase of the Design Science Research Process (DSRP), communication and refinement, focuses on the iterative improvement and validation of the developed artifact based on the systematic evaluation results and stakeholder feedback. In this study, the SMART – LSIS Framework the SMART-LSIS Framework underwent a rigorous refinement process following its initial evaluation, ensuring its alignment with both theoretical constructs and practical requirements within senior high school ICT governance environment.

Research Locale

The study was conducted in across all senior high schools under the Nasugbu East Sub-Office. These schools were chosen to provide a complete picture of how ICT systems are being used and managed within a shared educational administrative setting. Since these schools operate under the same sub – office, it offers a useful context for examining common practices as well as differences in ICT governance, auditing and information systems implementation.

Respondents of the Study

The respondents of the study consisted of 25 participants composed of ICT coordinators, registrars, IT Support staff, and school head. The selection of the respondents was based on purposive sampling, as they were directly involved in system operation.

Research Instrument

This study utilized survey questionnaire to gather the quantitative data in evaluating the SMART – LSIS Framework. The research instrument (SMART-LSIS Evaluation Questionnaire) focused on the key dimensions of ICT governance and information systems performance, specifically: IT Governance, IT Auditing, Security and Risk Management, System Performance, and User Satisfaction. The responses were measured using a five – point Likert scales, described and interpreted as follows: 1 – (3.26 to 4.00) Strongly Agree (SA), 3 – (2.51 to 3.25) Agree (A), 2 – (1.76 to 2.50) Disagree (D), – (1.00 to 1.75) Strongly Disagree (SD). The instrument was subjected to content validation by ICT governance expert's and academic specialists to ensure the clarity and alignment with established ICT governance frameworks, and yield an acceptable coefficient to ensure that the questionnaire is reliable.

Data Gathering

During the survey proper, an orientation or explanation of the purpose of the study was conducted and queries were answered for thorough understanding and transparency of the research. Then a questionnaire with the developed framework was provided to the respondents for formal evaluation. Also, the researcher gave an ample time to the respondents to properly accomplish the questionnaire. Further, the respondents were given the freedom to answer the questionnaire and/or withdraw if they wished to.

Data Analysis

To process the data, the researcher used percentage for respondents' profile; while the data for the five domains evaluated from the developed framework such as IT Governance, IT Auditing, Security and Risk Management, System Performance and User Satisfaction was analyzed using weighted mean to gain better understanding on the current school information system infrastructure.

Results and Discussions

Profile of Respondents

The 25 participants-stakeholders are properly represented to ensure appropriate representation.

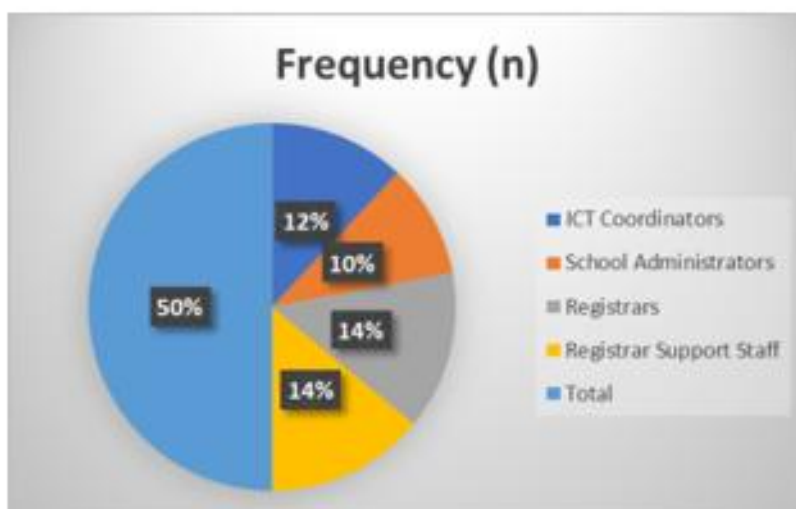


Figure 3: Demographic Profile of Respondents

Most of the participants who answered the inquiries, 56.00% work with records and registration. The other 44.00% are assigned with computers and networks as system administrators or technical staff. These departmental setups ensure that daily operations and scenarios were monitored realistically. Also, the representation from the respondents is made to gather the most appropriate data directly from the frontliners and key personnel.

Further, the findings signify that the manpower involve in school data management are relatively high within the scope of the settings of the study. This can be attributed to the limited IT governance systems that integrate and systematize school information system. Technologically upgrading school system would improve manpower planning (lessening manpower costs) or tasks assignment, thus improving school productivity. In addition, the holistic IT governance includes people working with the system that greatly influence the system and service efficiency. Moreover, it should be noted that limited plantilla is one aspect that can relate to the insufficient manpower to handle IT related maintenance and services, which equate to half of the combined manpower of the registrar and support staff within the locale and scope of the study. The data are in line with the perspectives of Vaya-Arboledas et al. (2025) which highlights demographics as a factor that influence IT governance. The inherent characteristics of IT governance not only resides on the technical aspect of operation and maintenance, but also on the intertwined relationship between human and technology factors.

Analysis of the SMART-LSIS Evaluation Questionnaire

Domain A: IT Governance

The IT Governance section measures how effectively the school organizes its technology goals, handles policy decisions, and aligns digital assets with long-term educational strategies.

Table 1 IT Governance Evaluation

Metric Indicators	Weighted Mean (M)	Verbal Interpretation
The school has clearly defined IT policies.	4.20	Agree
ICT systems are aligned with school objectives.	4.10	Agree
Decision-making for ICT is well-structured.	4.00	Agree
IT roles and responsibilities are clearly assigned.	4.13	Agree
Governance practices are consistently implemented.	3.97	Agree
Overall Domain Mean	4.08	Agree

The overall governance mean of 4.08, indicates that stakeholders recognize the existence of baseline IT policies and designated operational roles within their institutions. Also, it can also be noted that governance practices are consistency implemented has weighted mean of 3.97, although interpreted as agree shows the lowest aspect in IT governance. The overall results imply that the IT governance on the aspect of disseminated policies are well-received by the respondents; however, a slight variance on consistent governance practices conveyed the need for efficient and responsible IT governance.

The results are congruence with some IT-related studies, which highlights that governance is facing challenges related to learning management system and related applications (Weill & Ross, 2004; Wattimury & Faza, 2023). The adoption of COBIT system framework should be integrated properly to ensure institutional effectiveness, as well as efficient IT governance. The system adoption of course is intended to meet the intention and demand of the organization; thus, thorough analysis and planning is necessary to ensure implementation success and sustain operational requirements.

In addition, the assessment on IT governance encompasses the department-wide implementation and regulation/policies on national or division-wide level, and must be aligned to the organizational goals, thereby favorable assessment was achieved. This support the study of Karataş and Çakır (2024) that IT system and its related processes should be aligned to the organizational goals and objectives. This is similarly linked to the IT policies and structure was already established and currently implemented, hence positive or agreeable ratings were realized.

Domain B: IT Auditing

The IT Auditing domain assesses the school's capacity to trace user actions, review system modifications, preserve history logs, and verify compliance across administrative platforms.

Table 2 IT Auditing Evaluation

Metric Indicators	Weighted Mean (M)	Verbal Interpretation
The school regularly monitors system activities.	4.03	Agree
Audit trails are available in ICT systems.	3.90	Agree
There are procedures for compliance checking.	3.87	Agree
System logs are reviewed periodically.	3.80	Agree
IT audit processes are properly documented.	3.77	Agree
Overall Domain Mean	3.87	Agree

The IT Auditing domain received the lowest overall mean score ($M = 3.87$). While regular activity tracking remains acceptable ($M = 4.03$), documentation scores fall sharply ($M = 3.77$). This trend confirms that secondary schools routinely miss structured auditing practices; software logs are recorded automatically by servers but are rarely reviewed by IT staff unless a critical database failure or security exploit occurs.

As highlighted by Cooke (2020), structural clarity in audit processes and documentation is vital for converting raw system logs into actual institutional accountability. The low scoring across documentation and periodic reviews reinforces (Cooke, 2020; Wattimury & Faza, 2023) conclusion that the lack of formal, structured audit mechanisms directly compromises the overall transparency and reliability of internal information frameworks.

Domain C: Security and Risk Management

This segment analyzes data privacy standards, network access parameters, encryption protocols, and backup recovery mechanisms built into the school's technology setup.

Table 3 Security and Risk Management Evaluation

Metric Indicators	Weighted Mean (M)	Verbal Interpretation
Data privacy is strictly implemented.	4.27	Strongly Agree
Systems are protected from unauthorized access.	4.20	Agree
Cybersecurity measures are actively enforced.	4.10	Agree
Risks are regularly assessed and mitigated.	3.93	Agree
Backup and recovery systems are in place.	4.17	Agree
Overall Domain Mean	4.13	Agree

It can be gleaned that data privacy implementation has the highest mean of 4.27 (Strongly Agree), this imply that compliance with data privacy laws is a top priority. However, regular proactive risk assessments have a lower weighted mean of 3.93.

The findings concur the investigation by Krumova and Kataria (2023), which stated that educational software's are more focus of superficial security management while compromising regular system risk assessments. As such, preemptive measure should be prioritized as highlighted by Metin et al. (2024), on the sense that conventional system security management are ineffective to address multiple treats; hence, integrated system management is vital to efficient business process.

Institutionally, as the aspects of security and risks management are given with high priority by the department, the adopted system by general consensus assessment yield an agreeable assessment. On the other hand, the risks are regularly assessed and mitigated was noted with the lowest rating which can be the result of limited awareness by the respondents on the action/process of the system administrators. This of course, is not communicated on regular basis on the system users, but the notion or perception that risks management and mitigation are implemented, thence, the variability of assessment.

Domain D: System Performance

This section tracks the operational reliability, server stability, processing efficiency, and technical response times of current school platforms.

Table 4 System Performance Evaluation

Metric Indicators	Weighted Mean (M)	Verbal Interpretation
ICT systems are reliable and stable.	4.07	Agree
Systems respond efficiently during use.	3.93	Agree
Downtime is minimal or well-managed.	3.87	Agree
System performance is regularly monitored.	3.97	Agree
Technical issues are resolved promptly.	4.03	Agree
Overall Domain Mean	3.97	Agree

The system performance evaluation showed an overall satisfaction mean of 3.97 that emphasized the current system's operational limitations. While, downtime management with weighted of 3.87 is in consonance with the stakeholders' feedback on frequent system lagging and disconnection.

This supports the IS Success Model, which emphasizes that system quality and performance significantly influence user satisfaction and organizational effectiveness, and has been widely applied and extended in recent studies of educational information systems (DeLone & McLean, 2003; Al-Rahmi et al., 2022; Rosário & Dias, 2022).

In addition, the assessment although generally accepted reflects noticeable variability as expectations by the users for efficient technology-based information management system are high, thus, any downtime, speed inefficiency, and other system glitches can affect user's perspective relative to performance acceptability.

Domain E: User Satisfaction

This domain captures user sentiment regarding how well the digital tools support daily workflows, improve productivity, and satisfy systemic administrative demands.

Table 6 User Satisfaction Evaluation

Metric Indicators	Weighted Mean (M)	Verbal Interpretation
Users find the system easy to use.	4.17	Agree
The system supports teaching and learning.	4.30	Strongly Agree
The system improves productivity.	4.23	Strongly Agree
Users are satisfied with system performance.	4.10	Agree
Overall, the ICT system meets user needs.	4.20	Agree
Overall Domain Mean	4.20	Agree

The user satisfaction has a composite mean of 4.20. Thus, respondents agree on functionality of the system. In addition, respondents strongly agree that the systems enhance administrative productivity weighted mean of 4.23. Likewise, effectively support instructional delivery has weighted mean of 4.30, which strongly manifest the effectiveness of ICT support initiative of the department.

These results relate to the concepts of the IS Success Model (DeLone & McLean, 2003), which stated that the information systems quality is vital influence on users' satisfaction and tasks completion. Further, Al-Rahmi et al. (2022) investigated that well-designed system tends to gain higher user's satisfaction and productivity enhancement. Similarly, Rosário and Dias (2022) highlighted that consistent learning management implementation can enhance teaching and learning deliveries.

On the other hand, a higher rating by the user can be equated for probable system vulnerabilities if IT management and auditing are limited or insufficient (DeLone & McLean, 2003; Hevner et al., 2004; Metin et al., 2024).

Generally, efforts were made by decision-makers and system developers to provide and/or improve the information management systems to cater the needs of the education institution. Particularly, satisfaction on the system was recognized supporting the teaching and learning indicators.

Summary and Comprehensive Synthesis of Findings

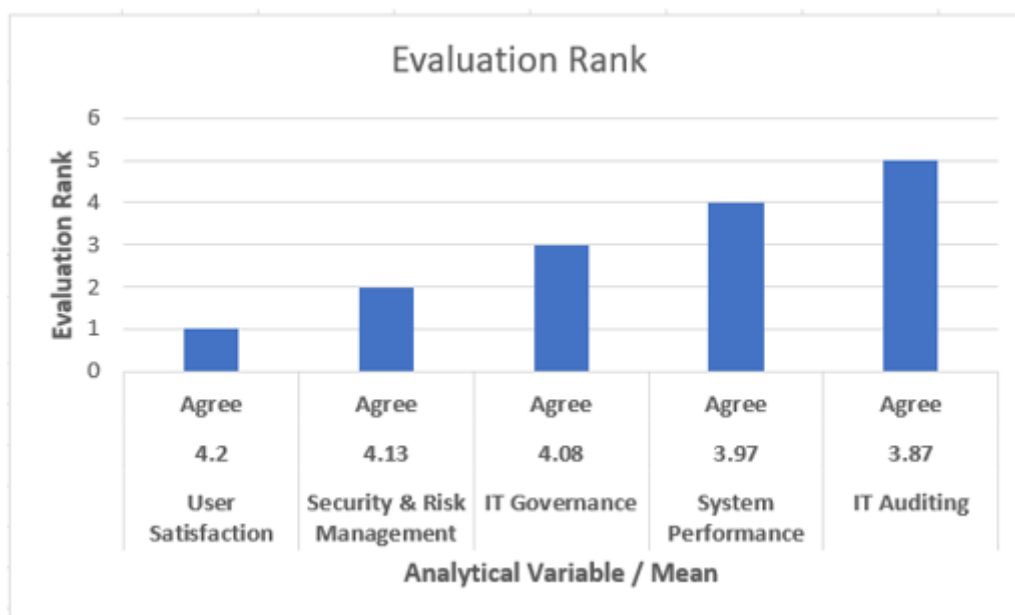


Figure 4. Summary of Overall Results

The evaluation across all domains yielded a Grand Mean of 4.05, confirming that stakeholders view the baseline features of their school information systems positively. However, stacking these results clearly reveals an operational hierarchy: user-facing utility and immediate security barriers are relatively mature, whereas foundational infrastructure tracking, performance monitoring, and compliance auditing lag behind, nonetheless favorable rating was achieved which can be credited to the efforts to provide the need for functional school information system.

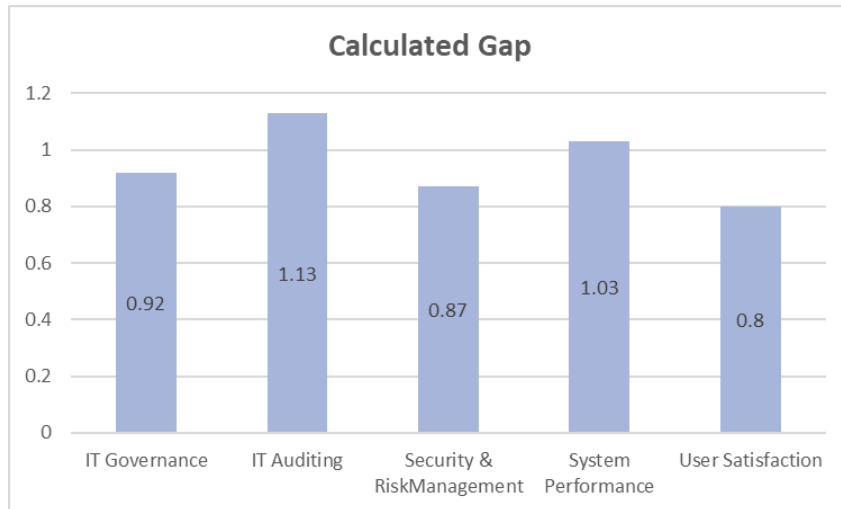


Figure 5. Gap Analysis (Ideal Mean = 5.00)

The data from gap analysis highlights the probable risk level. IT auditing shows the largest gap of 1.13, while system performance displayed a gap of 1.03. These findings reveal the main focus of this study. Institutions are adopting technologically software; however, it did not deliver the expected results or performance. The framework does not match with studies on IT governance; this implies the relationship of system efficiency and institutional productivity is tied on IT governance within the context of ICT implementation (Shokouhyar et al., 2020).

To mitigate this weakness, the SMART-LSIS framework was proposed. As such, employing the design science research (Hevner et al., 2021) would strengthen ICT management encompassing various commands and interfaces, thereby building robust system for effective institutional business processes.

Limitations of the Study

Despite the significant contribution of the SMART-LSIS Framework in addressing IT governance and auditing concerns within Senior High Schools, several limitations should be acknowledged.

First, the study involved only twenty-five (25) respondents from schools within a single educational jurisdiction. Although the participants were directly involved in ICT management and operations, the relatively small sample size and localized setting may limit the generalizability of the findings to other educational contexts and regions.

Second, the evaluation of the framework relied primarily on stakeholders' perceptions gathered through survey questionnaires. While stakeholder assessment is valuable in determining the framework's relevance, usability, and organizational fit, the study did not incorporate objective system performance indicators such as system uptime, response time, security incident reports, audit compliance rates, or other quantitative operational metrics.

Third, the framework was validated mainly in terms of acceptability and perceived applicability rather than actual implementation outcomes. The study did not conduct a full-scale deployment of the SMART-LSIS Framework, making it difficult to determine its long-term effectiveness in improving ICT governance, audit compliance, system security, and institutional performance.

Fourth, the study did not perform a comprehensive comparative analysis between the SMART-LSIS Framework and existing IT governance models such as COBIT 2019, ISO/IEC 38500, or other educational governance

frameworks. Such comparisons could have provided stronger evidence regarding the framework's unique contributions and advantages.

Finally, the study provided limited discussion on implementation challenges, including financial requirements, technical infrastructure readiness, organizational resistance, staff competencies, and resource availability across diverse school environments. These factors may significantly influence the successful adoption and sustainability of the proposed framework.

Therefore, while the SMART-LSIS Framework demonstrates strong potential as an educational IT governance and auditing model, further validation through broader implementation, longitudinal evaluation, and multi-site studies is necessary to establish its effectiveness and scalability.

CONCLUSION AND RECOMMENDATIONS

The SMART-LSIS successfully integrates IT governance and system success principles into a unified educational platform. Evaluation results indicate that governance alignment enhances usability, satisfaction, and institutional performance.

Conclusions

The study emphasizes that abrupt adoption of ICT management systems and/or other related educational software applications resulted to operational and structural disparity. High users' satisfaction on system functionality was generated; however, system sustainability is of great concern. The assessment of school ICT infrastructure yielded a grand weighted mean of 4.05, on the other hand, gap analysis revealed a major vulnerability on IT Auditing which scored the lowest mean of 3.87 and have the largest operational variance of 1.13.

Secondary schools frequently run administrative databases without formal log review policies, consistent compliance testing, or explicit audit trail tracking. This structural gap exposes sensitive educational repositories to data corruption, accountability failures, and operational downtime during high-volume periods. By utilizing Design Science Research principles, this study successfully built the SMART-LSIS Framework to resolve these systemic issues. The framework provides a multi-layered structure that embeds automated system auditing, rigorous policy governance, data security, and real-time performance tracking directly into the daily operational lifecycle of secondary education institutions. Conclusively, the current system satisfies the users expectations on the developed framework encompassing governance, performance, security and risk management, however, IT auditing variable needed special consideration to enhance the overall system functionality.

Recommendations

Based on the empirical findings and structural gaps identified in this study, the following recommendations are presented:

1. **Institutionalize the SMART-LSIS Framework:** Senior High School administrators should systematically adopt the SMART-LSIS multi-layered framework to align administrative tools with formalized, school-specific IT governance rules.
2. **Mandate Automated Audit Trails:** School technology departments must move away from reactive monitoring and activate continuous, tamper-resistant system logs and user tracking across all active LIS and LMS architectures.
3. **Establish Standardized Review Policies:** Academic institutions should enforce mandatory weekly reviews of automated server logs and system data modifications, transforming raw data traces into usable security and operational insights.
4. **Deploy Real-Time Performance Analytics:** School IT managers should run dedicated performance monitoring tools to identify network strains early, helping to prevent platform crashes during high-traffic enrollment and grading periods.

5. **Conduct Broader and Longitudinal Validation Studies.** Future researchers should implement and evaluate the SMART-LSIS Framework across multiple school divisions, regions, and educational settings using larger sample sizes. Future studies should incorporate objective performance metrics, comparative analyses with established governance frameworks, cost-benefit assessments, and long-term monitoring of implementation outcomes to further validate the effectiveness, scalability, and sustainability of the framework.

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