A Guide for Education Technology Systems

A Discussion of Learning Management Systems and Educational Management Information Systems

DEVELOPMENT GATEWAY
An IREX Venture

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Table of contents

Executive Summary

Education worldwide is facing a critical crossroads. The number of out-of-school children and youth has risen to a total of 250 million.[1] Among children in school, a large number are not learning as they should. As reported by the World Bank, "an estimated 70% of 10-year-olds are unable to comprehend a simple written text," a significant increase from pre-pandemic levels. This urgent need to recover lost ground comes amid unprecedented technological change. Furthermore, the rapid rise of artificial intelligence (AI) provides novel methods for aggregating and analyzing education data,[2] yet also present new potential challenges impeding learners' critical thinking and creativity.[3] This critical need to prepare learners for a tech-driven future comes amid a straining global financial environment.[4] To improve the state of education, resources must be deployed even more effectively.

Two essential tools to more effectively provide and monitor education levels include education technology systems: Education Management Information Systems (EMISs) and Learning Management Systems (LMSs). While distinct, these systems are complementary pillars of a modern education ecosystem:

- An EMIS supports ministries by collecting and analyzing data for national planning, progress monitoring, and resource allocation, fostering evidence-based decision-making.
- An LMS focuses on the classroom experience, enabling the design, delivery, and assessment of teaching and learning, including through AI-enabled features.

When integrated, an EMIS and an LMS can bridge the gap between student-level performance and system-level policy, allowing decision-makers to link data with interventions that directly improve educational outcomes.

This paper provides an overview of these systems. First, we define the systems and their strengths, then analyze their performance against criteria such as accessibility, adaptability, interoperability, security, and sustainability. The paper further examines the implications of adopting open-source versus proprietary solutions. Finally, we draw on country-specific case studies from Uganda, Guyana, the Bahamas, and Tanzania to provide practical insights through showcasing diverse deployment approaches and their outcomes.

Our analysis reveals that the successful and sustainable implementation of education systems depends less on the technology itself than on the enabling environment in which they operate. Key factors for success include the following:

- Creating effective clear data governance frameworks.
- Investing in resilient infrastructure and hosting solutions.
- Promoting active stakeholder engagement to build ownership and capacity.
- Approaching digital system deployment as a strategic investment in education system resilience and transformation, rather than a standalone technology project.

Implementing these recommendations not only lays the groundwork for improved data-for-decisionmaking for educators and administrators. These “data readiness” capabilities also permit organizations and agencies to more effectively evaluate, select, and deploy technology solutions in the future. By focusing on these strategic areas, governments can effectively modernize governance, enhance learning outcomes, and ensure equitable access to quality education.

Chapter 1
Introduction

Why is this paper needed at this time?

In an effort to enhance education system efficiency and digital transformation, ministries of education are frequently exploring the most suitable digital infrastructures to support both administrative functions and learning experiences. Education policymakers increasingly rely on digital tools to manage and enhance learning environments—ranging from Education Management Information Systems (EMIS) to Learning Management Systems (LMS). This push comes at a time of urgent need: the COVID-19 pandemic has exacerbated learning poverty,[5] with 70% of 10-year-olds in low- and middle-income countries unable to read and understand a simple text,[6] up from 57% pre-pandemic. Simultaneously, the rapid emergence of artificial intelligence and other digital technologies is reshaping the skills needed for the future of work. Yet many education systems remain underprepared: in sub-Saharan Africa, 89% of learners lack access to household computers and 82% lack internet access.[7] Investing in robust, inclusive, and adaptable digital education systems is therefore not only timely—it is essential to recover lost ground, close the digital divide, and prepare learners for a tech-driven future.

To prepare for this future, administrators and school officials are looking to implementing an EMIS and/or LMS. These systems provide critical information on school infrastructure, student enrollment, grades, attendance, and other indicators. However, they must be deployed thoughtfully and with a view toward both short- and long-term objectives to provide the most value while also minimizing costs.

Why did we focus on these systems?

Research often treats Education Management Information Systems and Learning Management Systems separately,[8,9] lacking direct comparisons that assess their relative suitability for different national contexts. Existing literature also tends to offer broad, generalized findings rather than country-specific assessments. This landscape makes it difficult for ministries of education to identify and implement solutions that align with their policy and infrastructure constraints. Furthermore,

there is a lack of practical, actionable guidance for ministries, particularly regarding how technical partnerships can support effective EMIS and LMS implementation. Given the increasing reliance on data-driven policymaking and digital learning tools, ministries of education require evidence-based recommendations to select and implement the most effective EMIS and LMS solutions for their needs. Investing in the right systems ensures efficient education management, improves learning experiences, and optimizes resource allocation.

This paper will first define these systems, then discuss existing options, and finally review how they've been integrated in country-specific case studies. This analysis excludes vocational schools, higher education institutions, and other post-secondary learning environments to ensure targeted recommendations relevant to primary and secondary education.

How was this paper written?

This paper builds upon insights from our previous written work, Evidence-Informed Policymaking: Education Data-Driven Decision Mapping in Kenya and Senegal, which examined education data ecosystems in Kenya and Senegal. The study identified key challenges, including unreliable education data, limited data-driven decision-making, and inadequate national capacity to manage and leverage data effectively. Findings from this report emphasized:

- The necessity for comprehensive data governance frameworks to ensure data reliability and accessibility;
- The importance of interoperability across digital systems to streamline data collection and integration; and
- The need for targeted investments in human resource capacity to enhance data literacy and utilization.

These insights serve as a foundation for assessing and recommending suitable EMIS and LMS solutions that align with national education priorities. These suggestions are expanded beyond Kenya and Senegal with a focus on educational needs, particularly of low- and middle-income countries. That said, high-income countries could benefit from more efficient education management information systems and can use the resources in this paper.

This paper was informed through extensive literature reviews, interviews with experts, and the authors' own experience in implementing technical systems. While in draft form, the paper was reviewed by several industry experts who provided invaluable feedback.

In sum, this paper provides strategic guidance for individuals interested in implementing education technology, including ministries of education, on selecting and implementing Education Management

Information Systems (EMIS) and Learning Management Systems (LMS). This document will aim to help them modernize administration, improve learning outcomes, and optimize resource allocation by fostering data-driven decision-making and bridging the gap between student performance and system-level policy. Additionally, the paper offers tangible recommendations for creating strong data governance frameworks and operational strategies to ensure successful and sustainable education technology deployments.

Let us begin with the definition of the bedrock of educational systems: EMIS and LMS.

Chapter 2
What is an EMIS and LMS?

Education systems rely on technology-driven solutions to enhance governance, streamline processes, and improve learning outcomes.

While an EMIS is designed for data collection, analysis, and policy formulation, an LMS focuses on facilitating teaching and learning. The integration of both systems can create a more effective education ecosystem by aligning student performance data with broader policy and resource planning. This paper explores the purpose, functions, and significance of EMIS and LMS in the education sector.

Education Management Information System (EMIS)

An EMIS can be defined as a "system for the collection, integration, processing, maintenance and dissemination of data and information to support decision-making, policy-analysis and formulation, planning, monitoring and management at all levels of an education system."[10]

EMIS data provides valuable insights for policymakers to develop education policies. Education Management Information Systems include comprehensive data on various aspects of education, including student enrollment, teacher qualifications, school infrastructure, and more. This data is essential for informed decision-making at all levels of the education system.

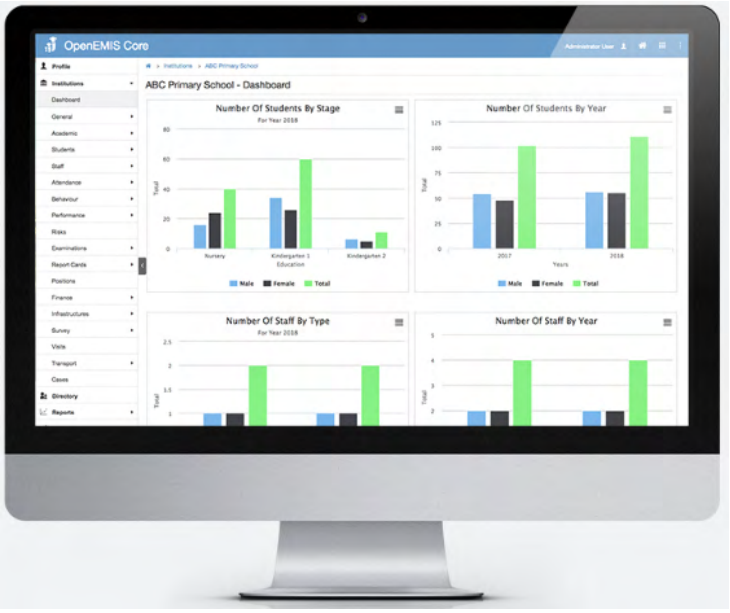


Figure 1. An example EMIS dashboard showcasing student data through the platform OpenEMIS. Image source: https://www.openemis.org/products/core

An EMIS can be used for the following purposes within the context of managing education data:

- **Data-driven policy and planning**

By providing accurate and real-time data, an EMIS helps policymakers and administrators allocate resources efficiently, develop curricula, and implement education reforms. This data-driven approach ensures that policy decisions are based on empirical evidence rather than assumptions.

- **Accountability and transparency**

Education accountability and transparency are critical in ensuring that institutions meet national and international education standards. An EMIS facilitates accurate reporting and compliance with global education goals such as the United Nations Sustainable Development Goal 4 (SDG 4) – Quality Education. The availability of reliable data ensures that governments and institutions can track progress, assess the impact of education policies, and maintain transparency in resource allocation and decision-making.

- **Resource allocation and management**

Efficient resource management is essential for the sustainability of education systems. An EMIS supports budgeting, teacher deployment, school infrastructure planning, and the distribution of learning materials. By analyzing demographic and financial data, policymakers can allocate resources effectively, ensuring that schools receive adequate funding and support based on their specific needs.

- **Stakeholder communication**

Effective communication is critical in the success of education systems. EMIS facilitates information sharing among governments, donors, educational institutions, and the public.

- **Reporting and compliance**

For any ecosystem, reporting is a key component as it provides insights into the effectiveness of the particular system. These reports are important to decision makers, donors, and other stakeholders. An EMIS can be used to report to donors or other international organizations on school and student performance.

- **Improved service delivery**

By providing accurate and timely information, EMIS data systems can help improve the quality of education services.

Learning Management System (LMS)

An LMS is a technology platform that enables the administration, delivery, tracking, and management of learning content and activities. This system is primarily used by educational institutions, corporate training programs, and e-learning providers. Within these institutions, teachers (or trainers) use an LMS to create and deliver instructional materials, assign and grade assessments, monitor student progress, and provide feedback. Administrators, on the other hand, are responsible for configuring the system, enrolling users, managing user permissions, generating reports, and ensuring the overall operation and maintenance of the platform.

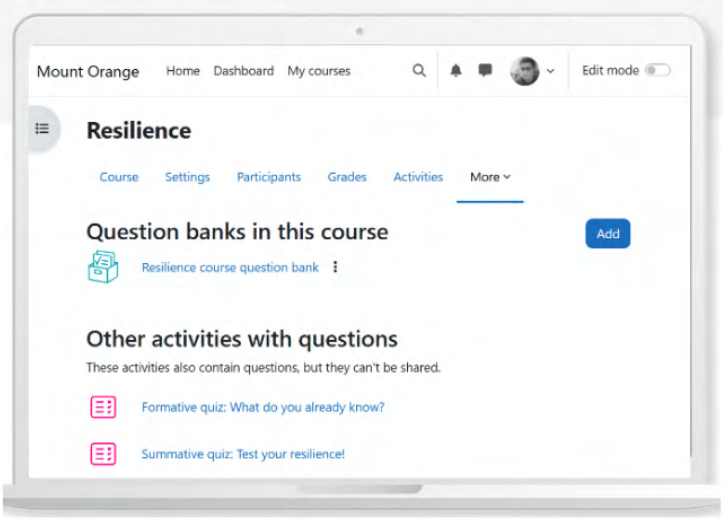


Figure 2. A screenshot of the Moodle dashboard showcasing a sample student's dashboard. Image source: https://moodle.org/.

Examples of EMISs include OpenEMIS, EduTrac, PowerSchool SIS, DHIS2 for Education, and the Unified District Information System for Education.

Students and parents can also use an LMS to access real-time information on coursework, grades, attendance, and progress tracking. Students benefit from interactive learning tools, timely feedback, and communication with instructors, while parents can monitor their child's academic journey, support learning at home, and stay informed about important announcements or deadlines.

An LMS facilitates remote and blended learning, enables personalized instruction, and provides assessment and reporting tools to educators and administrators, while also allowing parents to monitor their child's academic progress and students to actively engage with their learning materials and schedules.

The primary purposes of an LMS include:

- **Course management**

  An LMS enables the systematic creation, organization, and distribution of learning materials, including video lectures, quizzes, assignments, and interactive content. Educators can structure courses based on predefined curricula, ensuring that learning materials are delivered

in a logical sequence to optimize knowledge retention. Examples of open-source LMSs include Moodle, Open edX, or Canvas LMS.

- **Learner engagement and interaction**

To foster an interactive learning environment, LMS platforms support communication and collaboration through discussion forums, live chat, and real-time feedback mechanisms. These features encourage active participation, peer-to-peer learning, and continuous engagement between students and instructors.

- **Performance tracking and analytics**

One of the key advantages of an LMS is its ability to monitor student progress through comprehensive analytics. Educators can assess learner performance based on assessments, completion rates, and engagement metrics. These insights enable the identification of areas where students may require additional support, facilitating data-driven instructional strategies.

- **Personalized learning**

LMS platforms support adaptive learning paths that cater to individual student needs, learning preferences, and progress rates. By leveraging artificial intelligence and machine learning algorithms, an LMS can tailor content and activities to enhance personalized learning experiences. This approach helps bridge knowledge gaps and promotes a more effective learning process.

- **Certification and compliance management**

Many LMS platforms incorporate credentialing and certification mechanisms, ensuring that learners meet specific competency requirements. In corporate settings, LMS solutions assist in regulatory compliance by tracking mandatory training programs and generating reports for auditing purposes. This feature is particularly crucial for industries requiring ongoing professional development and accreditation.

These capabilities can also be enhanced through artificial intelligence. For example, an LMS can now utilize artificial intelligence to provide personalized learning pathways, analyze student data to identify strengths and weaknesses, and by providing real-time answers or coaching to students' questions.[11]

All educational materials, resources, and communication are stored and accessed in one platform, ensuring consistency and easy access for all users. Learners can access content from different devices, accommodating diverse schedules and learning paces.

An LMS also facilitates communication and collaboration between students and educators through forums, chat rooms, and group assignments, fostering an interactive learning environment. These

systems can integrate with tools like Zoom, Google Workspace, Microsoft Teams, and content repositories, streamlining operations and enhancing user experience. They enable ongoing professional development for educators and lifelong learning opportunities for students.

LMS platforms ensure data security, protecting sensitive information such as grades, personal data, and communication records. They can accommodate a growing number of students, courses, and content without requiring significant additional resources.

Integrating an EMIS and LMS provides a holistic approach to education management by linking administrative data with learning insights. This integration creates a data-driven ecosystem that enhances policymaking, resource allocation, and student outcomes.

Examples of LMS systems include Moodle, Open edX, Canvas LMS, Blackboard, TalentLMS, Absorb LMS, Teachable, Google Classroom, and Tangerine.

Integration of EMIS and LMS

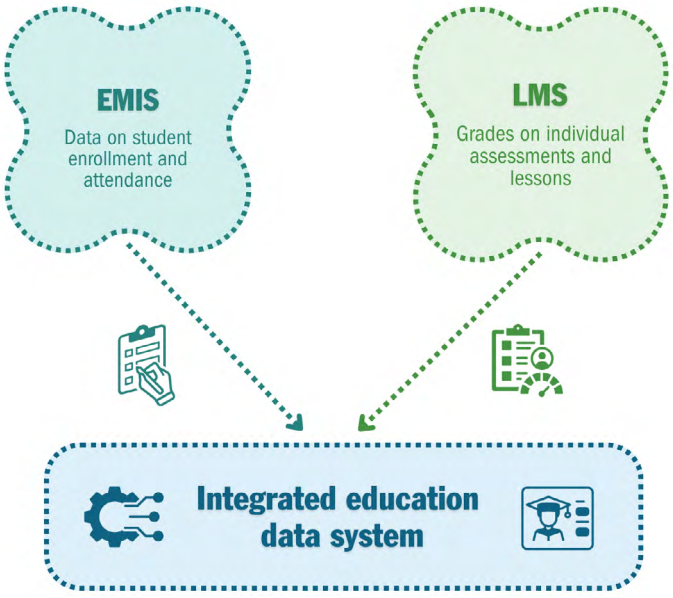


Figure 3. Schematic showcasing the possible integration of an EMIS and LMS

It's also worth noting the possibility of integrating EMIS and LMS platforms. This integration facilitates two-way transfer of essential student data, enrollment, and daily attendance as well as assessment records between both systems. The integration supports consistency in data representation and reduces manual entry, minimizing errors and improving overall data integrity, while providing school administrators and teachers with user-friendly, supportive technology. This kind of integration is often described as a "full view" of the education data system. For example, if a student who is scoring poorly on exams (as tracked in an LMS) is also found to be having poor attendance in schools (as tracked via an EMIS), that information can be used to plan more successful interventions by teachers and administrators.[12] A representation of this kind of data is showcased on the left.

The next critical consideration in system selection is whether to adopt an open-source or closed-source platform. This decision has far-reaching implications for **cost-effectiveness, long-term sustainability, and national ownership** and is critical for **ensuring interoperability, adaptability to local needs, and data sovereignty.** The following section examines the comparative advantages,

trade-offs, and illustrative examples of both approaches, providing a framework to guide ministries of education in aligning their choice with strategic priorities and implementation capacity.

In Summary

Although EMIS and LMS share some common factors, their distinct objectives require different consideration factors for implementation and optimization. The table below presents a summary of each system and its core functionalities.

	EMIS	LMS
Primary purpose	Manages administrative, operational, and institutional data.	Facilitates teaching, learning, and content delivery.
Users	School administrators, government officials, policymakers and teachers.	Teachers, students, administrators, parents.
Data management	Handles student enrollment, attendance, staff records, budgeting and institutional performance. Also incorporates a broader range of data beyond academic metrics. This includes—among the most common components—information on school feeding programs, health and vaccination status of students and staff, academic performance, behavior tracking, early warning indicators, institutional infrastructure, and teaching and learning resources.	Manages course content, student progress, assignments, and grades.
Analytics and reporting	Provides reports on school performance, student enrollment trends, and government compliance. Generates the data needed to calculate key performance indicators (KPIs) for monitoring the Education Sector Plan, track progress toward national development goals and SDG 4, and to support evidence-based decision-making.	Generates reports on student engagement, quiz scores, and learning progress.
Integration	Often integrates with government databases, HR systems, and finance management tools.	Integrates with content authoring tools, virtual classrooms, and assessment platforms.

Automation	Automates administrative workflows like admission, attendance, teacher evaluations, and student transfers. Automates the production of standard indicators.	Automates grading, assignment submissions, and course scheduling.
Communication	Facilitates communication at the institutional level (e.g., notices, staff coordination). Strengthens communication through effective data dissemination to schools and institutions, across departments within the ministry of education, throughout the broader national government and externally to fulfill a ministry's reporting obligations to the UNESCO Institute for Statistics (UIS).	Supports direct teacher-student interaction through discussion forums, messaging, and feedback tools.
Security and compliance	Ensures institutional data security and compliance with educational policies.	Ensures student privacy, content security, and adherence to academic policies.
Scalability	Suited for large-scale education management (district, state, or national level). Collects, stores, and manages an increasing amount of data and accommodates an increasing number of users. The data collected in the system should be scalable enough to meet the demands of a ministry of education.	Scales based on course enrollments, institutional needs, or self-paced learning models.

While both EMIS and LMS are components of a modern education ecosystem, they serve different purposes and are typically used at different levels of the system:

EMIS platforms are primarily utilized by central- and district-level education administrators for policy planning, resource allocation, and system-wide monitoring. They aggregate data from schools to support national decision-making processes. LMS platforms are mainly used at the school and classroom level by teachers, students, and school administrators to support teaching and learning activities—such as lesson delivery, assessments, and tracking student progress.

Chapter 3
Selecting and Implementing EMIS and LMS Systems

To determine which EMIS platforms and LMS platforms to implement, it is first worth gaining an initial understanding of closed-source and open-source systems.

A Background in Closed- vs. Open-Source Systems

Open source software refers to software whose source code is publicly available, so the source code can be accessed for free by anyone who wants to as long as they adhere to the specified license terms. Closed-source software refers to software whose source code is not available for access to the public, so only the source code owners and authorized entities can access the source code.[13]

Open-source licenses are licenses for software that grant the end users the right to use the software, examine the source code and even modify it and redistribute the modified source code as long as they adhere to the attached open-source license terms.[14]

Open-source educational technology systems are designed to offer cost-effective, flexible, and scalable solutions for managing education data and facilitating learning. Open-source platforms allow for customization, interoperability, and long-term sustainability, making them well-suited for national-level education initiatives. Examples include **Moodle, Open edX**, and **Chamilo** for learning management and **OpenEMIS** and **DHIS2** for **education data and student information management**. These systems will be discussed in more detail in the next section.

However, the absence of license fees should not be taken to mean that open-source tools are “free,” as they require active maintenance. Another key element of sustainability and growth for open-source solutions lies in community strategy—leveraging the contributions of community members, such as developers, users, researchers, and institutions. By actively participating in development, testing, documentation, and knowledge sharing, the community helps sustain and enhance the system, ensuring mutual benefit and long-term value for all stakeholders involved.

However, some ministries of education have chosen to deploy closed-source systems. These EMISs are sometimes preferred because they rely on in-country vendors and may offer unique features. Some examples of these closed-source proprietary EMISs are PowerSchool, SIMS, Blackbaud, and iSAMS.

Closed-source LMS solutions are also used across educational institutions and organizations - and include Canvas, BlackBoard, etc. They include features for content delivery, student management, assessment and reporting. Unlike open-source LMSs, they are not customizable without vendor approval. They also often require direct, paid, vendor support for customization.

The main differences between open-source and closed-source systems lie in accessibility, customization, cost and control, as summarized in the following table:

	Open-Source Systems	Closed-Source Systems
Source code and customization	The **source code is publicly available**, allowing institutions and individuals to modify, customize, and adapt the system to their specific needs. However, the modification and sharing depends on the type of license. Here is a list of some popular open-source licenses and how they work.[12]	The **source code is proprietary**, meaning schools, individuals, or governments cannot modify the systems without the vendor's permission. They must rely on the vendor for updates and custom features.
Cost and licensing	Generally **free to use**, but costs may be incurred for technical assistance for customization, implementation services, training, and support.	Requires **licensing fees**, and costs can be high depending on the vendor, number of users, and additional features.
Support and maintenance	Relies on **community support** or in-house IT teams. Some organizations offer **paid professional support** (e.g., DHIS2, OpenEMIS)	Comes with **dedicated vendor support**, including maintenance, troubleshooting, and updates.
Data security and control	Institutions have **full control over data**, which is crucial for governments prioritizing data sovereignty. However, security depends on proper implementation and updates.	Typically provides **built-in security and compliance**, but data is often stored on vendor-controlled servers, raising privacy concerns. Security depends on implementation and updates.

Integration and scalability	Offers **greater flexibility** for integration with other systems through application programming interfaces (APIs) but may require technical expertise.	Usually integrates well within the vendor's ecosystem but may have **limited compatibility** with external systems.

Open-source EMISs are more cost-effective and sustainable compared to proprietary options. In addition, they are more suitable for governments and institutions seeking more control over their education data, as they allow for customization, ensure data sovereignty and localization, and eliminate licensing costs. Open-source EMISs are particularly suited for organizations that are cost-conscious and have the necessary technical expertise to manage and maintain the system. Additionally, open-source systems offer greater sustainability because they are not dependent on a specific vendor, which reduces the risk of system obsolescence or vendor lock-in.

On the other hand, a closed-source EMIS is a better choice for environments that prioritize a ready-to-use solution with built-in support, regular updates, and reliable vendor assistance over the considerations listed above. While it comes at a premium cost, from $8,000 for small schools to $200,000 for large schools,[13] this solution may offer convenience, security, and a streamlined user experience without the need for extensive in-house technical expertise. However, sustainability can be a concern, as schools are dependent on the vendor for long-term support, updates, and system changes.

Popular EMIS and LMS Systems

Given the more cost-effective and sustainable approach, the remainder of this paper will predominantly focus on open-source systems. Two prominent open-source education management information systems are OpenEMIS and DHIS2 Education, both of which support data-driven decision-making in education, but with differing functionalities.

OpenEMIS is an open-source, web-based system built on the EMIS specification designed specifically for education sector data management. The system helps governments and organizations collect, store, and analyze education-related data, such as student enrollment, teacher records, and school performance and produce country-defined key performance indicators for dissemination, reporting, and informed decision-making.

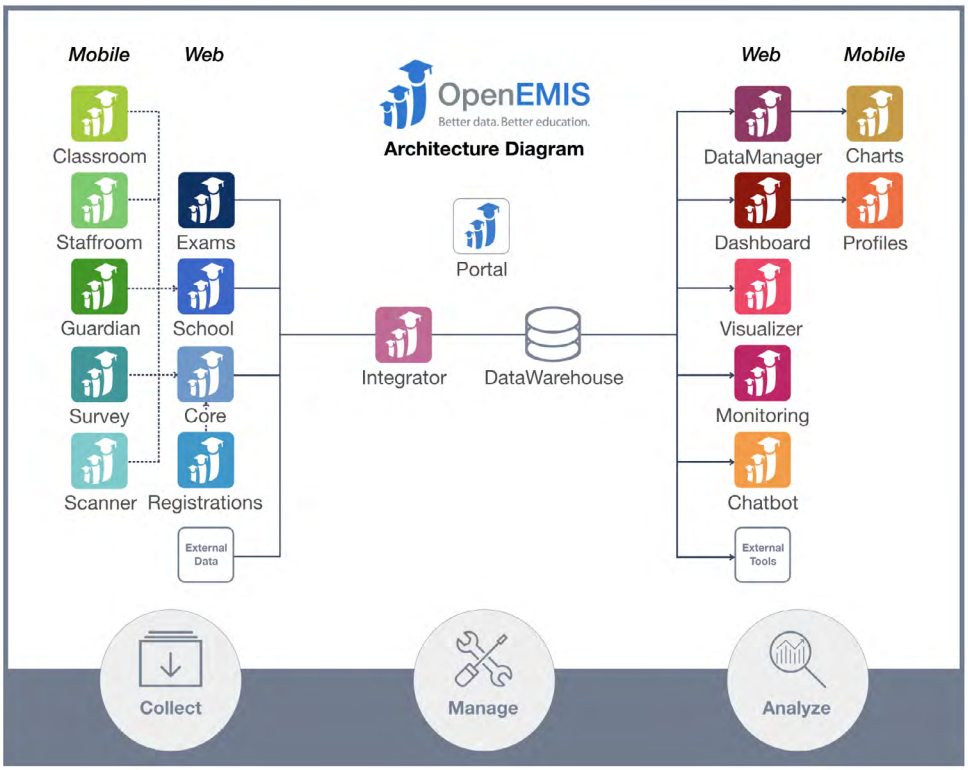


Figure 4. OpenEMIS Architecture

As you can see from the diagram above, OpenEMIS is a modular system. The OpenEMIS Lab supports a suite of software applications that are designed to be integrated with other OpenEMIS software or other external solutions. A few examples of these OpenEMIS modules are apps related to education sector planning progress and textbook distribution.

DHIS2 Education (District Health Information System 2) is an open-source, license-free health data management platform that has been adapted for education data tracking. Originally designed for public health systems, DHIS2 Education allows governments to monitor education and related indicators, manage schools, and track student performance. DHIS2 Education supports classroom-level data and district-level data visualization and aggregation by default. DHIS2 Education tracks attendance data, as well as broader student data, such as socio-economic profiles, school feeding programs, and other school-based surveillance reporting that supports populational health.[17]

In the LMS space, two widely adopted open-source platforms are Moodle and Open EdX. Moodle is an open-source LMS used by schools to create and manage online courses. The system offers features like quizzes, grading, course management, and extensive plugin support for customization.

OpenEdX is an open-source e-learning platform designed for large-scale online courses (known as massive open online courses, or MOOCs). It provides interactive learning experiences with video lectures, assessments, discussion forums, and analytics, making it ideal for schools offering online education.

System Selection

Given the significant variations in classroom environments, the decision matrix below offers strategic guidance for selecting EMIS and LMS solutions, outlining recommended systems and integration approaches tailored to specific contexts such as connectivity and digital infrastructure.

Context	Recommended EMIS	Recommended LMS	Integration Approach
Rural area with low connectivity	Open-source EMIS with offline capabilities, such as DHIS2 and OpenEMIS	Moodle-based LMS with offline capabilities (see the Tanzania case study for reference)	District-level offline sync
Urban or rural area with mixed digital infrastructure (unreliable connectivity, intermittent electricity and fewer devices)	Cloud-hosted with local back up EMIS	LMS with mobile design	Real time (partial) sync
Urban area with high connectivity	Cloud-hosted EMIS with API	Cloud-hosted LMS, such as Open EdX	Real time API integration
Data sovereignty concerns	Open-source EMIS that is locally hosted	Open-source LMS	Integration server that is on premise

System Implementation

Implementing an LMS, an EMIS, or both requires planning and strategic decision-making, including a structured approach to implementation. Informed by insights from as well as our technical team's own experiences with system implementations, the table below summarizes key factors to be addressed to ensure a smooth rollout and long-term sucess.

Factor	EMIS	LMS
Implementation policy	**Policy framework:** A policy framework should ideally precede an EMIS implementation to establish clear governance structures, define the scope of data collection and usage, and ensure compliance with national and international data standards. The policy should guide how EMIS supports education planning, monitoring, and reporting.[18]	**LMS policy:** An LMS policy should focus on how digital platforms support teaching, learning and learner assessment at the classroom and school levels. This policy should ensure content alignment with national education learning goals.[19]
Accessibility	**Access to data across different profiles in the education ecosystem:** Each individual in the ecosystem (teachers, school administrations, and central-level officials) should have controlled access to the data they need to perform their functions.[15] **Ease of use in accessing data:** The system should be user-friendly for teachers, school administrators and central-level officials with varying technical expertise and infrastructure.[20]	**Ease of use across users**: The system should be user-friendly for students, teachers, parents/caregivers, administrators, and policymakers with different technical skills.[21]

Interoperability	**Integration with existing systems**: The EMIS should be able to integrate seamlessly with current education infrastructure (e.g., student information systems, learning management systems, and infrastructure outside of education (e.g., health and social care, national identification, etc.) **Data portability**: The system should allow easy migration of data between systems and formats **APIs and standards compliance**: EMIS platforms should be able to rely on APIs for secure data exchange with other systems and compliant with international standards for education.	**Integration with existing Systems**: The LMS should integrate with student information systems (SIS), digital libraries, EMISs, and national education portals. **Data portability and export**: It should allow easy data migration and report generation in standard formats (CSV, PDF, etc.) **APIs and standards compliance**: The LMS should be configured to follow international standards for interoperability.
Scalability	**Handling growth**: The EMIS platform should accommodate growing and changing needs (collect, store, and manage an increasing number of data and accommodate an increasing number of users). The data collected in the system should be scalable enough to meet the demands of a ministry of education.[22]	**Handling growth**: The system should support increasing numbers of users, institutions, and courses
Infrastructure	**Hosting**: An EMIS requires centralized databases and government or institutional servers as well as network security.	**LMS installation on cloud vs. on-premise**: A country's digital infrastructure should offer flexible hosting options.

Adaptability	**Customization**: The EMIS should be designed to meet key use cases and requirements as stated by national education ministries.[22] An EMIS requires tailored features based on institutional policies and regulatory compliance. The system should be tailored to meet national curriculum standards or educational priorities.	**Customization for future needs**: An LMS should be expandable with new features or modules. The system needs flexibility to support diverse teaching methods and learning styles. **Adaptability to national curriculum**: An LMS should support unique educational policies, grading systems, and learning structures. **Flexible content creation**: Teachers and institutions should be able to modify or create their own courses, quizzes, and materials (e.g., video, audio, PDFs, quizzes, and interactive solutions). **Language support**: LMS interfaces, features and content should ideally be localized for different languages.

User role management	**User profiles support**: Requires training for school administrators, policymakers, and IT staff. **Communication plan**: An EMIS communication plan ensures that education data is shared effectively with all relevant stakeholders to support transparency, decision-making, and accountability. **Data dissemination plan**: An EMIS data dissemination plan ensures that key education statistics—such as enrollment, learning outcomes, teacher deployment, infrastructure, and budget data—are shared regularly and accessible to all relevant stakeholders. Dissemination channels may include public dashboards, statistical reports, policy briefs, and stakeholder workshops. Data should be presented in user-friendly formats and released on a regular schedule. Clear roles must be assigned within the ministry to manage production and outreach, while feedback mechanisms help improve future dissemination efforts and ensure data meets users' needs. **Change in management strategy**: An EMIS should adapt to changes in management strategies, such as shifts in policy priorities, organizational structures, or data requirements to ensure that the system remains relevant, responsive, and aligned with evolving sectoral goals and decision-making needs.	**User profiles support:** Supports different levels of access for students, teachers, school officials, and government policymakers. **Alignment with educational needs**: The system should be adapted to national curriculum standards and teaching methodologies. **Inclusivity**: The system should accommodate students with disabilities (e.g., screen readers, alternative input methods). **User feedback mechanism**: The system should include ways for users to provide feedback for continuous improvement. **Interactivity and collaboration**: The system should include tools for discussions, forums, group projects, and real-time feedback. **Assessment and grading tools**: The system should be able to manage quizzes, assignments, automated grading, and peer reviews. **Personalization**: The system should be configured to accommodate diverse learning styles and paces.

Reporting and analysis	**Ability to view aggregated data for planning and decision-making:** User profiles should have access to input data but also have view access to results and data aggregation to enable them to make decisions with the data through customizable dashboards, data visualizations, and reports. In some more sophisticated systems, is there an ability to incorporate predictive analytics/ forecasting (e.g., to identify at-risk students, predict teacher shortages, red flag infrastructure stresses, etc.?)	**Analytics and performance tracking**: The system should be able to provide insights into student progress, course effectiveness and learning patterns as well as predictive analytics.
Device and platform compatibility	**System compatibility:** An EMIS should function on a range of devices (computers, tablets, smartphones) and operating systems.	**System compatibility:** An LMS should function seamlessly on computers, tablets, and smartphones across different operating systems.
Offline access	**Offline functionality:** An EMIS should be able to function without consistent internet access for data entry and analysis.	**Offline functionality:** Students should be able to access materials without active internet access.
Disaster recovery and backup	**Failover and backup:** Implement failover systems, redundancy, and secure cloud storage.	**Failover and backup:** Implement failover systems, redundancy, and secure cloud storage.
Privacy and security	**Data protection**: Student and teacher data should be safeguarded **Compliance**: EMIS should be compliant with local and international regulations.	**Data protection**: The LMS should follow best practices in student and teacher data protection. **Compliance**: It should be aligned with global and national data privacy laws and local education data policies. **User authentication and access control**: It should provide role-based access, encryption, and secure authentication (e.g., SSO, MFA)

Sustainability	**Initial and ongoing costs**: Determine the total cost of ownership, including setup, hosting, training, maintenance, and ongoing upgrades. Refer to the section on Open-Source vs. Closed-Source Systems to inform these cost considerations. **Affordability**: For sustainability purposes, it should be financially feasible for the ministry to implement at scale. **Licensing**: Determine the affordability of the systems license, especially in the case of proprietary or hybrid systems.	**Initial and ongoing costs**: Determine the total cost of ownership, including setup, hosting, training, maintenance, and ongoing upgrades. Refer to the section on Open-Source vs. Closed-Source Systems to inform these cost considerations. **Affordability**: Determine if the system can be implemented at scale within the national budget. **Licensing**: Determine the affordability of the systems license, especially in the case of proprietary or hybrid systems.
High-level architecture	**System complexity:** Determine how simple/complex the architecture is based on the number of modules included, as well as the technologies used in the architecture.	**System complexity**: Determine how simple/complex the architecture is based on the number of modules included, (e.g., content management, assessments, analytics, communication tools) **Technology stack**: Determine the programming languages, databases, and frameworks used. **Maintenance requirements**: Determine how much technical expertise is required to manage the system.

Training and admin support	**Training and professional development**: Determine the availability of training programs to support continuous training. **Pre-service training for teachers and administrators**: Preparatory activities provided before formal training begins can include orientation on training goals, technical setup, baseline assessments, scheduling information, and access to introductory materials. **Technical support**: Determine if ongoing support is provided for troubleshooting and updates. For example, there is a vast community that supports EMISs, such as those that support DHIS2 and extends to DHIS2 Education. These resources include public Github repositories and online training, communities of practice, and local networks. **Ease of monitoring**: Verify if administrators can track and report progress effectively. **Data analysis**: Consider analysis and interpretation of data for decision making at all levels, including the classroom, school, district/region and national level.	**Training and professional development:** Determine the availability of training materials and workshops for teachers and administrators.[21] **Technical support and documentation:** Determine the reliability of customer support, as well as the helpfulness of user guides, FAQs, and troubleshooting guides. **Monitoring and reporting:** Verify if administrators can easily track student progress, engagement, and system performance.

System Evaluation

Implementing and optimizing education technology systems are crucial steps toward establishing a well-developed and sustainable digital environment. However, post-implementation, it is equally important to deploy external frameworks and resources as benchmarks to rigorously evaluate these systems.

For instance, after implementing an EMIS, ministries of education can utilize resources such as UNESCO's EMIS Progress Assessment Tool for Transformation (EPATT).[23] This tool provides a framework to evaluate the system's maturity, identify strengths and weaknesses, and prioritize areas for improvement across key dimensions such as technical architecture, governance, and policy.

This tool enables ministries to strategically guide the transformation of their EMIS into a more integrated, responsive, and effective tool for education sector planning and monitoring. It analyzes how well EMIS components align, detects imbalances or bottlenecks, and supports evidence-based recommendations. Based on this analysis, EPATT guides ministries to either consolidate the existing system through better alignment or transform it further by leveraging key change drivers, always tailored to national capacities.

Figure 5: UNESCO's EPATT Framework

While direct EPATT-like systems are not currently available for learning management systems, institutions can still leverage various frameworks and diagnostic tools. Examples include the EDUCAUSE Learning Space Rating System (LSRS), which scores a classroom's design effectiveness for learning goals. Another example includes structured rubrics, such as those applied by the World Bank and Mastercard Foundation to assess LMS systems in Uganda.[24] These tools help institutions assess readiness, guide implementation, and enhance the effective use of new platforms.

Understanding these EMIS and LMS systems—both in aggregate and individually—can paint a picture of how these different systems can be implemented at the country level, as discussed further below.

Chapter 4
Country Profiles and Case Studies

How can we learn from the examples of other countries to learn from the decisions they made?

This section will explore country-specific education systems used in Uganda, Guyana, the Bahamas, and Tanzania. These systems will be examined for their unique characteristics, strengths, and suitability for addressing local educational needs.

Piloting DHIS2 Education in Uganda

Since 2011, Uganda has utilized DHIS2[1] as its national health management information system. Building on this experience, the Basic Education Department of Uganda's Ministry of Education and Sports (MoES) collaborated with Health Information Systems Program (HISP) to begin piloting a district-level EMIS, known as DHIS2-DEMIS, in mid-2019.

The pilot started in two districts, representing urban, peri-urban, and rural settings, and later expanded to four districts serving as learning sites.[25]

The system facilitates collection of data surrounding various indicators, including:

- Student enrollment (gender, age distribution, dropout rates)
- Infrastructure status (classrooms, desks, sanitation facilities)
- Human resources (teacher deployment, training, absenteeism)
- School feeding programs (meal distribution and nutrition levels)
- Gender equality
- Learners with special needs (tracking students with disabilities)
- Vulnerable children (orphans, students from low-income backgrounds)
- Monitoring of marginalized regions[26]

1 Interview with Monica Amuha, HISP-Uganda, Zoom interview, Tuesday, March 4, 2025

Ugandan districts utilize the following key features of DHIS2-DEMIS:

1. **Decentralized Data Entry and Management**
   - Unlike traditional EMIS systems that rely on manual, paper-based reporting, DHIS2-DEMIS enables direct data entry at school and district levels.
   - Schools can update data in real-time.
   - District officials can review, validate, and aggregate reports.

2. **Customized Visual Dashboards and Analytics**
   - DHIS2-DEMIS provides an interactive dashboard with charts, maps, graphs, and custom reports for different levels of education.
   - Geospatial dashboards track regional differences in education services.
   - Real-time visualizations permit viewing data and processed information.

3. **Mobile and Offline Data Collection**
   - The system allows for offline data entry.
   - The DHIS2-DEMIS Android Data Capture App offers mobile compatibility that allows teachers and administrators to easily update the data using smartphones.[26,27]

4. **Chatbot to facilitate data collection, retrieval, reporting, and decision-making.**
5. **Add-on support**
   - DEMIS allows the developers to create new, smaller apps on top of the core system. A good example is the digital Report Card, an app that was developed by HISP West and Central Africa and is now adopted in Uganda as part of cross-country sharing innovations add-on, which enables the schools to automatically generate report cards.

6. **Decentralized team for local support**
   - The HISP-Uganda team provides the required localized expert support, which is standard wherever DHIS2 is implemented.

Challenges faced in the implementation of DHIS2-DEMIS

Through this implementation, there have been a number of challenges, particularly on the operational side. These are listed below:

1. **Vendor lock-in with a closed-source system**

   Although DHIS2-DEMIS was deployed in several districts, at a national level, the Government of Uganda has committed to a different, closed-source EMIS provider. For this reason, the

government is highly dependent on a single vendor for its EMIS, making it difficult to transition to alternative or competitive systems, such as DHIS2-DEMIS.

2. Lack of overarching policy support for technical systems

There is no guiding EMIS policy in Uganda. Without a guiding policy, EMIS is often implemented in a fragmented or ad hoc manner, making it difficult to ensure compatibility with national education goals, institutional structures, and data governance standards. In addition, when roles, responsibilities, and the purpose of data collection are not clearly defined and communicated, education actors—such as teachers, school leaders, and district officers—often do not feel accountable or invested in the process.

3. Limited adoption by private schools

Most private schools are reluctant to provide the information needed by DHIS2-EMIS. Private schools struggle to divest their resources into implementing a system for which there is no dedicated IT support or additional financial resources. For this reason, Uganda is missing education data from private schools, and their educational data analysis at the national level does not represent the whole populace.

> *"We've seen low reporting rates, especially from private schools. Private schools say, 'We get school grants, so why should we submit this data?'"*
>
> Monicah Amuha, HISP Uganda

4. Lack of dedicated officers at the district level

The officers HISP trains for support of DHIS2 are mostly not dedicated to this role alone, which means they often are reassigned to a new role, get another job, etc. This frequent turnover leads to inconsistent data analysis and collection, and training new data officers frequently is a challenge.

5. Need for capacity building in utilizing data for decision-making

One of the most significant challenges arises from a lack of awareness or knowledge about the data available within the system, particularly at the sub-national level. At the district level, limited knowledge of education data management means that many local education officers and administrators do not fully understand how to collect, interpret, and use data from the

EMIS. This results in underutilization of the system, lack of data-driven decision-making, and poor data quality. Without proper training on how to use, analyze, and apply data, education officials may not prioritize or value the EMIS, reducing its impact on improving the education sector.

6. Infrastructure challenges

Infrastructure issues such as power and internet outages lead to disruption of the data entry process and synchronization.

> *"Sometimes there are power outages. Other times, we give internet access. All those challenges hinder access and use of the system. DHIS2 has an offline functionality to give users the possibility to add data, even without an internet connection."* [2]
>
> *Monicah Amuha, HISP Uganda*

Lessons learned from Uganda

1. Even the most technically sound system cannot succeed without a guiding EMIS policy and political buy-in. Creating a strong policy framework helps integrate EMIS into the national education system in a strategic way, while also making sure it can adjust to changes as the sector develops.

2. Investing in capacity-building is key to ensure awareness of, access to, and use of education data for decision-making among education officials at the national and sub-national level.

3. A human resources plan can clarify roles and responsibilities among education officials, particularly at the sub-national level. This plan should include a clarification of roles and responsibilities for education officials who are assigned to data entry and data analysis and can ensure proper support while reducing turnover.

Implementing OpenEMIS in Guyana

The implementation of OpenEMIS in 2018 in Guyana stands out as a model of strategic leadership and context-driven design. Piloted by a visionary Chief Planning Officer within the Ministry of

2 Interview with Monicah Amuha, HISP-Uganda

Education, the initiative aimed to go beyond traditional EMIS functions by aligning education data systems directly with the country's Sector Education Plan. Rather than imposing a one-size-fits-all solution, the team prioritized tailoring the system to meet the unique needs of each school—many of which are located in remote, hard-to-reach areas.

Through targeted surveys and deep familiarity with local school conditions, OpenEMIS was deployed in a way that ensured relevance, practicality, and usability, especially in under-resourced contexts. The project, a collaborative effort with Community Systems Foundation and the Ministry of Education, piloted OpenEMIS to report progress towards the Education Sector Plan. The officials started OpenEMIS as a pilot in 2018 to digitize the paper-based annual school census.

After a successful deployment of the system, OpenEMIS is now included in Guyana's education policy. In addition, the ministry has prioritized training users in how to use the system and has funded software development activities to build on the existing OpenEMIS software so that their OpenEMIS covers the entire education system—primary and secondary, as well as technical and vocational training.

Guyana's approach reflects a strong commitment to data-driven school improvement, underpinned by clear goals and a realistic understanding of on-the-ground challenges.

Despite progress, Guyana still faces barriers such as poor internet access in rural areas, limited availability of digital devices, and varying levels of digital literacy among school leaders.[27] However, the ministry has made strides by providing continuous training and building a stronger data culture, aided by tools like the GradeMaker Analytics System, which supports data-driven remediation and performance monitoring.

The ministry is collaborating with OpenEMIS Lab to develop a strategy for collecting regular data, including from schools with limited or no internet connectivity. OpenEMIS Lab provides a suite of subscription-based support services to facilitate the implementation of OpenEMIS, including cloud hosting, service desk support, and maintenance. Additionally, a range of technical assistance services—such as policy and planning support, implementation guidance, training, software development, and data analytics—are available on demand to meet the evolving needs of the education system.

Looking ahead, the ministry plans to expand the EMIS functionality through new modules such as report cards, early warning systems, and integration with LMS systems.

Lessons learned from Guyana

1. Continuous capacity strengthening builds long-term skills and a strong data culture for decision-making.

2. Contextualising EMIS functionality to national contexts, particularly through a sector education plan or similar model, can increase relevance and adoption.

3. Extending EMIS functionality to meet needs of technical and vocational education and training ensures that data covers a holistic picture of national education.

A Case Study of Integrated EMIS and LMS: Bahamas

The Bahamas case study is unique precisely because this is the primary country we reviewed that showcased how these systems can work together to provide a comprehensive view of educational data.[3]

The Ministry of Education Bahamas has decided to integrate their OpenEMIS[29] with the One on One Learning Management System (LMS), a proprietary online learning platform.[30] The operational implementation of the OpenEMIS and One on One LMS integration involves the automated synchronization of core student and academic information. OpenEMIS acts as the central repository for all student data, as well as data on staff (teachers and administrative staff), learning assets and schools and institutions. The OpenEMIS suite of software is also used to produce key performance indicators and generate reports, dashboards and insights to inform decision-making in the Ministry of Education. This information is systematically exchanged with the One on One LMS, enabling the LMS to create student accounts, populate class lists, and track student progress. The data exchange mechanism utilizes APIs to ensure secure and reliable transfer in near real-time, with data elements mapped to align with the schema requirements of each system. The synchronization process maintains data accuracy and reflects near real-time changes in student status and academic performance.

The data flow between the two platforms reduces redundancy, enhances data-driven decision-making, and strengthens the overall efficiency of the education system. The ongoing evolution of this integrated ecosystem holds promise for continued advancement in the delivery of educational services within the Bahamas and beyond.

The ministry continues to enhance the ed tech ecosystem to the benefit of teachers, learners and parents, most recently with the introduction of new software applications such as OpenEMIS Exams.[31]

3 Interview with John Kapp, e-mail exchange, 30 May 2025

Lessons learned from the Bahamas

1. API-based integration between EMIS and LMS systems ensures data accuracy, reduces manual entry, and reflects near real time changes in data.

2. An integrated data flow and visualization supports better planning and individualized learning

Tanzania's National Custom LMS

Tanzania's development of a custom LMS to improve its education delivery showcases how open-sourced LMS tools can be adapted to fit national education priorities.

Before this development, Tanzania struggled with variable teaching quality, as well as a teacher shortage, particularly in rural areas.[32] In response to a need for more online resources to support teachers, the University of Dar es Salaam, through Dr. Elia A. Kalinga, developed a custom LMS called the Tanzania Secondary Schools e-Learning system, or TanSSe-L.[33]

TanSSe-L was developed through customizing the open-source Moodle LMS to cater specifically to the needs of its secondary education sector. This initiative aimed to enhance digital learning accessibility across the country while embracing the power of open-source technology.[31] The key features of the LMS system are outlined below:

Key Features

• Curriculum alignment: TanSSe-L has been tailored to align with the country's national secondary school curriculum, ensuring relevance and coherence in the education context.

• User-friendly interface: The platform was designed with a simplified user interface to accommodate varying levels of digital literacy among teachers and students.

• Offline accessibility: The platform was developed while incorporating the need for connectivity challenges in remote areas. This offline accessibility ensures that the platform is widely accessible almost anywhere within the country.

• Scalability: The system was structured to support a growing number of users, facilitating its adoption across numerous schools nationwide.

• Performance analytics: The platform provides built-in tools for student activity, gradebooks, and course completion. School and district admins can generate performance data for insights on national education progress.

• Multiformat content support: The platform can accommodate different forms of content including PDFs, interactive HTML content, recorded audio, videos, etc.

• Security and access control: Admins can easily control visibility of content based on roles and permissions.

The implementation of these platforms did bring concerns.[32] For example, students and teachers were worried about the negative potential impact on Tanzanian culture and potential access to inappropriate material and other distractions. Certain teachers and administrators also expressed trepidation with using technical tools. However, some of the positive impacts of this implementation are noted below, as respondents indicated that the TanSSE-L system:

• Facilitated more equitable access to education resources in most parts of the country, including remote areas

• Improved teaching and learning: Teachers are able to be more engaging and are able to use more innovative methods to teach

• Increased ICT literacy: By using the platform, students are able to develop valuable skills that are increasingly important in the modern world

• Enhanced curriculum implementation: The system has helped the government to effectively deliver curriculum across different schools

Lessons learned from Tanzania

1. LMS design that is aligned with the curriculum will improve relevance and enhance teacher uptake of the system.

2. In areas of low connectivity, offline access to systems is critical to ensure there is equity among students, especially those in hard-to-reach areas with limited connectivity.

3. Cultural concerns must be taken into consideration in development of digital tools and addressed through stakeholder engagement at an early stage.

Key Takeaways from Case Studies

The key takeaways from these case studies offer valuable insights for ministries of education seeking to strengthen their EMIS and LMS. The experiences of Uganda, Guyana, the Bahamas, and Tanzania clearly demonstrate that ***the success of education technology initiatives depends not on the technology alone, but also on strategic leadership, strong policy alignment, infrastructure readiness, system interoperability, and the capacity to scale and adapt to evolving needs.***

These examples reinforce the notion that any single EMIS or LMS is not a one-size-fits-all solution. Rather, systems must be tailored to national and local contexts to effectively promote data-informed decision-making that enhances transparency, inclusion, and learning outcomes. When implemented thoughtfully, technical systems can serve as a cornerstone for building more resilient and responsive education systems and improve educational outcomes.

Chapter 5
Recommendations: A Way Forward

As ministries of education strive to modernize education systems and improve the education sector, the implementation of digital tools—particularly EMIS and LMS—provides a valuable path forward. These platforms offer essential capabilities for planning, monitoring, and enhancing both teaching and learning.

When considering which system to prioritize, focus on the following key areas to ensure a successful implementation:

- **For EMIS implementation:** Prioritize administrative data governance, policy alignment, and national reporting requirements.
- **For LMIS implementation:** Prioritize curriculum integration, student engagement, and teacher adoption.
- **For a combined EMIS-LMS system:** Prioritize system and API interoperability, data exchange standards, and clear decision-making authority.

Ultimate success depends not only on technology, but on an inclusive strategy that addresses the whole ecosystem in which these systems operate.

Successful deployment depends on several key considerations, including technical infrastructure, user adoption, financial sustainability, and integration with existing systems. Organizations must ensure compatibility, security and scalability while also addressing stakeholder engagement, training, and long-term maintenance.

By taking a structured approach to implementation, institutions can maximize the system's effectiveness, enhance educational outcomes, and streamline administrative processes. Several areas require targeted attention—namely, the establishment of strong data governance frameworks, the development of secure and standardized data-sharing protocols, investments in robust and inclusive technical infrastructure, and sustained capacity-building for end users and system administrators. The following recommendations, informed by our team's experience implementing digital systems at the sub-national and national level, are therefore designed to address these prerequisites and guide ministries of education in creating a resilient, interoperable, and user-centered digital education ecosystem.

Design implementation needs

Design a comprehensive plan for system implementation

- Key considerations include data accuracy and security, performance monitoring, ensuring a high-quality user experience, seamless scalability, and automated abilities.

Data governance and international standards

Develop strong data governance frameworks

- Define clear education policies for data collection, use, and sharing
- Use role-based access controls and audit mechanisms.
- Assign accountability (e.g., data officers, institutional leads).

Follow international standards

- Consider ISCED (UNESCO), ISTE, CIS, and IBO frameworks.

Focus on data quality

- Validate, clean, and verify data regularly.
- Use standardized templates and reporting tools.
- Clarify roles to avoid overburdening teachers with data entry.

Stakeholder engagement and capacity-building

Accessibility

- Involve end users from the start: Engage teachers, students, administrators and policymakers in the design and development process to ensure ownership, relevance, and usability.
- Conduct pilot programs: Test the system in real-world settings before full-scale deployment.
- Offer training and onboarding:
  - Offer ongoing training for all users, including educators, IT staff, and administrators.
  - Develop user-friendly manuals, video tutorials, and onboarding materials.
- Promote adoption through system champions: Successful systems change often requires champions who can lead by example, provide support, and encourage uptake.

Infrastructure and hosting

Assess technical readiness

- Evaluate connectivity, devices, and software across all locations.
- Plan for accessibility across devices (desktop, tablet, mobile).

Invest in reliable internet

- Prioritize rural and underserved areas to ensure equitable access.
- Include offline access to support data entry and data quality.

Hosting infrastructure

- Use cloud solutions (AWS, Azure, Google Cloud) rather than local services for scalability and resilience.
- Offer hybrid/on-premises options where privacy regulations require.
- Ensure backup and disaster recovery plans are in place.
- Optimize infrastructure for low latency and high availability.

Usability, analytics, and decision-making

Develop intuitive, user-centered interfaces

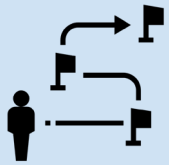
- Create dashboards tailored to different user types (teachers, policymakers, administrators).
- Enable disaggregated data visualization by gender, socioeconomic status, disability, etc.

Enable real-time reporting

- Integrate tools for real-time monitoring of attendance, performance, and resource allocation.

Clarify decision-making workflows

- Define how and when users are expected to engage with data.
- Embed clear data-use protocols for planning and operations.



Long-term sustainability & innovation

Plan for financial sustainability

- Budget for development, updates, capacity-building, and infrastructure.
- Promote transparent cost structures and identify long-term funding sources.

Leverage public-private partnerships (PPPs)

- Collaborate with private sector and development partners for funding and expertise.

Enable continuous improvement

- Implement version control for system updates and feature rollouts.
- Ensure systems can scale and adapt to evolving needs.

Integrate emerging technologies

- Evaluate the feasibility of integrating AI-enabled tools and machine learning for personalized learning and predictive analytics.

Chapter 6
Conclusion

The successful implementation of EMIS and LMS platforms represents an opportunity for ministries of education to modernize governance, enhance learning outcomes, and ensure equitable access to quality education. However, digital systems alone are not a solution—they must be embedded within a broader vision that emphasizes sustainability, inclusivity, and continuous improvement. By adopting open-source, interoperable, and user-centered approaches—supported by robust data governance, stakeholder engagement, and long-term financing—ministries can lay the foundation for resilient and adaptive education ecosystems. These strategies ensure an agency's "readiness" at organizational and digital levels. Committing to these recommendations enables stakeholders to most effectively navigate a complex market to select tools that genuinely add value for what they need - whether that is focused on EMIS, LMS, or a combination of the two. Moving forward, a clear commitment to collaboration, capacity-building, and evidence-based decision-making will be essential to realizing the full potential of digital transformation in education.

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