# KNOWLEDGE PACK

# EMIS 2.0 : Learning And Accountability System Architecture (LASA)





# **KNOWLEDGE PACK**

### **EMIS 2.0**

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# Introduction

### What is a KP?

Knowledge Packages (KPs) are short, pragmatic guides on individual topics within EdTech, meant to provide sufficient knowledge and understanding so that non-technical stakeholders can make key planning, design, and procurement decisions for education.

They can be used as a starting point for the planning of technology deployment to improve education, especially with education ministries.

### **About this KP**

EMIS 2.0 is part of a broader EdTech Program Framework and should always be considered an element of the solution that includes adequate software, incentives, policies and training.

This KP focuses on

- Education Management Information Systems (EMIS Systems)
- Enterprise Architecture planning and deployment.
- Data Collection, Quality and Analytics

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# Introduction

The EMIS 2.0 Learning and Accountability System Architecture (LASA) Knowledge Pack focuses on guiding Ministries of Education as they commit to a continuous school improvement process that leverages data and **technology**, to inform decision-making, which results in positive outcomes for learners.

The Knowledge Pack presents examples of the problems faced in various Ministries of Education with respect to data and technology usage and suggests policy options and strategies that have been found useful in such situations.

EMIS 2.0 responds to the idea of supporting and strengthening 'systems', rather than further supporting fragmented efforts of data collection and analytics- which is far too common and worsens the disconnected decision making even further. We know that fragmentation occurs

business processes.

### when the focus is on siloed applications, lots of redundant 'innovations', incongruent data management and archaic

# wнo are the main stakeholders?

### **TARGET AUDIENCE FOR THIS KNOWLEDGE PACK**

This Knowledge Pack is intended to be useful for any group or individual with a stake in education and assumes as its **primary audience Ministry leadership** tasked with collection and analysis of data for

accountability and compliance
 instruction and learning management
 reporting

To illustrate key ideas and recommendations, the Knowledge Pack includes examples of the transformation enabled by the effective generation and use of data.

The identification of specific programs or products in these examples is to provide a clearer understanding of innovative ideas and is not meant as an endorsement.

This Knowledge pack guides stakeholders through the processes and provides practical steps to drive the generation and usage of the right educational data at the right time.

is this KP designed? WHY

### **MOTIVATIONS : WHY IS THIS OF IMPORTANCE?**

**Despite all the activity within** ministries of education, the capacity to produce data vastly outstrips ability to use it. From research and reviews into EMIS activities since 1998, there are dozens examples of projects improving data collection but failing to improve data usage and student outcomes.

Using data can make a significant difference in schools continuous improvement efforts, as data enables a clear understanding of the gaps between where the schools are and where the schools want to be.

**Inconsistency of data across the** various departments (assessments, learning management, enrolment) has been noted as an area of significant

concern –in most countries there were no established data governance policies in place stipulating how data was stored, managed, modified or accessed.

Lack of inter-operability between **Software Applications** that produce and consume data across Education Agencies has also been highlighted as a significant challenge in maintaining the integrity of the collected data in traditional EMIS systems.

Whilst many ministries of education gather data, there are typically an insufficient number of stakeholders adequately trained in data quality management and analysis to support the usage of this data.

Many countries have reported an inability to effectively use data **collected**, since the data is not mapped to **Unique Identifiers** – The linking of Identities within the education system is a critical implementation component that can enable the monitoring and tracking of the performance of students, teachers, and management of schools.

WHY is this KP designed ?

### **OBJECTIVES OF EMIS 2.0**

In order to drive a shift within the Ministry of Education from being an efficient generator and collector of data to an organization that translates data into information that guides improvement, a broad effort and a clear, shared vision is required.

A properly implemented EMIS system will ensure that All educators and policy makers have easy access to information and knowledge to make important decisions that continually improve teaching and learning across the country.

Once implemented, the EMIS system should create a Virtuous Cycle of data production and data usage that drives informed decision making in the Ministry of Education.

The Vision of EMIS 2.0 Knowledge Pack

is to empower Education Agencies by providing them with

- Best practices and clear processes
- Tools blueprints and checklists

that enable them to deploy technology enabled solutions that drive educational objectives with cost-efficiency, reducing duplicative expenditures and achieving better return on investments. EMIS2.0 is a broad architecture that needs to be custom built based on existing legacy systems and processes (whether analog or digital or both) as well as the culture and org structure in place. This Knowledge Pack is a guide designed to inform technical design for countries, based on what already exists in-country, what the countries vision and ambitions are, and what the country can afford to procure and maintain – both cost and quality.



**CORE CONCEPT** 

An EMIS is

"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."

(UNESCO, 2008: 101)

Note: For the purpose of this guidebook, the focus is on K-12 Education

# are the potential solutions? **EMIS 1.0 AND 2.0** Database WHAT DOES TRADITIONAL EMIS (AKA EMIS 1.0) PROVIDE? Traditional EMIS implementations in most countries are typically setup as below: Key activities involve the periodic one-way transfer of student information from schools to the central government, without any feedback loops back to the school. numbers). 2 3 4 Data is typically collected manually on paper

and transferred to the school system or central government office, where it is added to the EMIS database.

Which results in below average results for the Ministry of Education investment (Source: World Bank EMIS Lessons Learned).



Student Information

Mainly demographic data is collected (gender and age, enrollment and drop-out rates, some assessment data, and student population

The data is collected for reporting purposes, and there are no analytics or early warning systems incorporated into the system to guide decision making and improve student outcomes.

Reports

### EMIS 1.0 AND 2.0

### WHAT IS THE DIFFERENCE BETWEEN EMIS 1.0 AND EMIS 2.0?

	Key Processes	EMIS 1.0
<u> </u>	Data Governance Process to ensure Integrity of Data across different Education departments.	Not Defined
Â	Interoperability of Systems Across Educational Agency using Open Standards and APIs between applications.	Not Mandated
X	Data Architecture Across Learning Systems, Assessments Systems, Reporting Systems.	Not Mandated
	Identity Management uniquely managed across all Assets (students teachers' schools and equipment).	Not Mandated
00	Microservices instead of Monolithic systems: While <b>monolithic</b> systems are a single unified unit, <b>microservices</b> architecture breaks the system into a collection of smaller independent units which carry out every application process as a separate service.	Not Mandated
	Effectiveness in Analysis of data and Dissemination of Findings	Not Standardized

# 

### **Policy Area**

Quality Data

System Soundness

System Soundness

Enabling Environment

System Soundness

Utilization for Decision Making

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### **EMIS 1.0 AND 2.0**

### **EMIS 2.0 : END STATE TARGET CAPABILITIES VISUAL ARCHITECTURE**



Virtuous Cycle of Data Generation, Consumption and Feedback to inform decisions and drive outcomes

### **DATA IN EDUCATION**

### WHAT IS DATA IN EDUCATION?

Education data is broad and typically includes information from multiple sources to support students and manage schools.

There are 4 major categories of data that Ministries of Education need to consider collecting, analyzing, and utilizing for decision making:

### **1. Demographic Data**

- **2. Perceptions Data** (Values and beliefs of parents, students, and teachers)
- 3. Student Learning (Assessment Data)
- 4. School Programs and Processes Data.

When the 4 categories of data are used together, they can effectively provide Ministries of Education the information they need to improve student performance.

> SCHOOL Processes/ Program Data



### **DATA IN EDUCATION**

### INTERSECTION OF MULTIPLE MEASURES OF DATA

### 4.0

If all subgroups of students are represented in the different programs offered by the school.

- Curriculum
- Policies
- Procedures and Practices

### 3.0

What Programs are most effective in improving Student outcomes?



Adapted from: Bernhardt, V. L. (2004). Data Analysis for Continuous School Improvement.

Do students of different ethnicities perceive the learning environment differently, and do they score differently on standardized achievement tests in patterns consistent with these perceptions?

### 1.0

Are groups of Students Experiencing Schools Differently?

- Perceptions of the Learning Environment by teachers, parents, learners
- Values and Beliefs

### 2.0

What is the Relationship Between Perceptions and Student Outcomes?

### **DATA IN EDUCATION**

### **ASPECTS OF DATA MANAGEMENT UNDER CONSIDERATION IN THIS KP**

- Acquisition & processing
- Storage
- Digital Maturity
- Integration
- Standards

**Data Collection** 

### **Data Quality**

- Data Governance
- Data Management
- Data provisioning

• Descriptive Causal • Predictive • Prescriptive

### **Data Analytics**

### **DATA IN EDUCATION**

### **THEORY OF CHANGE : DATA AS A LEVER FOR CHANGE**



### **OUTCOMES**

as:

- generators and consumers.
- leadership and instructors.
- Stakeholders.
- well governed systems.



1. Improved learning outcomes due to analysis of assessments and feedback loop between data

2. Improved Educator Performance due to analysis of teacher outcomes and feedback loop between

**3.** Good Management Practices and Satisfaction of

**4.** Reduced IT Total Cost of Ownership within Ministries of Education due to implementation of interoperable

### **EMIS CORE POLICY AREAS**

### **4 CRITICAL BUILDING BLOCKS REQUIRED FOR SUCCESSFUL EMIS IMPLEMENTATION IN A COUNTRY**

1	Enabling Environment Assessment of intended policies in relation to building a sustainable infrastructure and human resources that can handle data collection, management, and access.	<ul> <li>Legal Framework</li> <li>Organizational Structure &amp; Institutionalized Processes</li> <li>Human Resources</li> <li>Infrastructural Capacity</li> <li>Budget</li> <li>Data-driven culture</li> </ul>
2	System Soundness Assessment of the degree to which the processes and structure support the components of a comprehensive system.	<ul> <li>Data Architecture</li> <li>Data Coverage</li> <li>Data Analytics</li> <li>Dynamic System</li> <li>Serviceability</li> </ul>
3	Quality Data Assessment of the degree to which the system accurately collects, securely saves, and produces high quality timely information for use in decision- making.	<ul> <li>Methodological Soundness</li> <li>Accuracy and Reliability</li> <li>Integrity</li> <li>Periodicity and Timeliness</li> </ul>
4	Utilization for Decision Making Assessment of the reality of system implementation and utilization of information in decision-making.	<ul> <li>Openness to EMIS Users</li> <li>Operational Use</li> <li>Accessibility</li> <li>Effectiveness in Disseminating Findings/Results</li> </ul>

Source : Figure 1- The four core EMIS policy areas, from Husein Abdul Hamid, SABER-EMIS

# This KP focuses on items 2 and 3 only

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to implement next steps? HOW

### WHEN IS THE RIGHT TIME TO IMPLEMENT EMIS 2.0?

separate, non-integrated systems.



If Ministry of Education desires better organized and timely data to meet instructional needs, then EMIS 2.0/ LASA provides a good structure for enabling policy implementation.

If Ministry of Education desires better coordination of program decisions to achieve better planning and anticipation of budgetary impacts on the organization and the technology systems.

If Ministry of Education has planned launch of a major reform initiative that will require coordination between teams, e.g. moving to blended learning, flipping the classroom, personalizing instruction (adaptive learning).

# If Ministry of Education needs better integration between departments, or elimination of redundant sources or silos of data from

### to implement next steps? HOW

### **ARCHITECTURE ROADMAP IMPLEMENTATION PLAN 1/2**

It is strongly recommended that countries commit to a multi-year process of building a robust system that enables the creation, continued analysis and use of data to drive positive outcomes for students. Countries should begin by reviewing the Architecture Roadmap Implementation plan:

### **1. Set up MoE EMIS2.0 Country Planning Team constituted with**

the right expertise. Review the recommended Team setup and Skill Self-Assessment toolkit (Appendix A).

### 2. Conduct a Needs Assessment with key stakeholders and document project vision: (Appendix B)

- Document MoE objectives
- Identify and document the list of issues/ scenarios to be addressed
- Map Requirements
- Develop Solution Concept diagram

### 3. Determine the Target SDG4 Data Indicators to be tracked and

### YEAR 1

document the associated sources data (either existing applications, manual systems, or future apps), creating inventory of data that exists and data that needs to be collected for SDG4 goal tracking (Appendix C).

### **4. Information Systems (Applications** and Data) Architecture: Review

existing data flow and applications within the Ministry of Education, (baseline architecture) Defining the Ministries data storage, management and maintenance, including logical and physical data models and applications (target architecture) utilizing guidance and checklists found in Appendix E (Applications architecture) and



**5. Define Application Interoperability** Standards (Appendix J).

6. Develop Data Migration Plan to move existing Data from old systems to new systems by executing (Appendix G).

7. Technology Architecture : Describe all necessary hardware, software and IT infrastructure required to develop and deploy defined system applications (Appendix H).

### How to implement next steps?

### **ARCHITECTURE ROADMAP IMPLEMENTATION PLAN 2/2**



YEAR 2

YEAR 3

8. Define Risk Mitigation Plans: Identify and Document Risks associated with implementation of EMIS2.0 in MoE and document mitigation strategies (Appendix O).

9.Define Country Wide Student / Teacher Identifier Requirements (Appendix I).

**10. Review UIS EMIS Buyers Guide found here.** 

1. Select Vendors for Each selected Capability.

**2. Select Pilot Schools** for Ministry of Education to test initial deployment.

**3. Train EMIS2.0 Team on Data Analytics** (Appendix K).

**4. Document the test results** (User Acceptance Tests). 1. Implement Country Wide Digital Skills Training Centres for teachers and principles.

2. Kick-off Country-wide implementation.

**11.Prepare RFP.** 



### to implement next steps? HOW

### **EMIS 2.0 IMPLEMENTATION CHALLENGES AND COMMON BARRIERS**

Project leads should review this checklist, which is designed to assist implementation teams avoid some of these challenges (Appendix P).

Lack of a clearly defined and well communicated MoE vision that fits within the broader country vision with respect to digitization of education processes.

# 2

Stakeholders from across other relevant Ministries (including Ministry responsible for issuance of unique student Identifier numbers, Ministry of ICT responsible for Data **Governance and management** policies) are often not consulted or incorporated early on into the planning cycle , which discourages broad acceptance for MoE strategies and hinders future alignment.

### 3

Whilst deploying EMIS infrastructural projects, MoE teams often do not create and establish clear roadmaps outlining the planned progression from the current to the future state, nor align on the criteria to determine the priority of projects to launch. As a result, unrealistic timelines and inadequate resources are allocated for deployment, resulting in outcomes that do not match stakeholder expectations.

### Conclusion



As Ministries of Education begin to deploy new software and hardware technology across the Ministry as well as in schools, investments in people and processes will ensure that the Ministry is able to continue to meet educational goals and stakeholder expectations.

This knowledge pack offers a **blueprint to map and** align educational objectives, strategies, roles and



This knowledge pack has examined the components and processes necessary to develop and effectively deploy EMIS systems within the Ministry and suggested an architectural road-map that countries can consider as a guide as they plan their implementation. Countries should flexibly adapt the proposed schedule for the architectural roadmap, to suit their needs.

Similar to other complex organizations, education agencies must establish efficient and cost-effective structures to collect, retain and share data in pursuit of their mission and goals.



# responsibilities, data and technology.



### To go further CLOUD OF KPs



### OTHER EXISTING RELATED KPs







LMS

Ecosystems

Procurement

# RELATED SOURCES



For further resources refer to the <u>Annexes</u>

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### Annexes

### GLOSSARY

ACRONYM	Definition
EMIS	Education Management Information System. An EMIS can be defined as 'a system for the collect maintenance and dissemination of data and information to support
API	Application Programming Interface
EA	Enterprise Architecture (EA) is the practice of analyzing, designing, planning and implementing execute on business strategies
HR MIS	Human Resources Management Information System
SDG	Sustainable Development Goals. Sustainable Development Goal 4 is about quality education and Development Goals established by the United Nations in September 2015.
LASA	Learning and Accountability System Architecture
SABER	Systems Approach for Better Education Results-Education Management Information.
ISCED	International Standard Classification of Education (ISCED 2011) provides a comprehensive fram and qualification
TOGAF	The Open Group Architecture Framework

tion, integration, processing, enterprise analysis to successfully d is among the 17 Sustainable nework for organizing education programs



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