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What Matters Most for Education Management Information Systems: A Framework Paper



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Abstract

The main objective of this paper is to outline what matters most for an effective education management information system (EMIS). It presents the conceptual background and operational tools for the Systems Approach for Better Education Results (SABER)-EMIS domain. These tools are intended for use by government education policy makers to assess policy areas of relevance to a country's EMIS against international best practices.

This paper begins with an introduction of the domain and the rationale for an EMIS benchmarking tool. Chapter 1 then provides an overview of current data-related demands to improve education, explains how an EMIS meets those data demands, and highlights examples of specific systems in action. Chapter 2 outlines what matters in an EMIS, starting with an explanation of what comprises the construct validity and theoretical underpinnings for benchmarking an EMIS. This chapter shows that the guiding principles behind an EMIS drive actionable policies.

A detailed description of four policy areas—specifically, the enabling environment, system soundness, data quality, and utilization for decision making—then follows in chapter 3. That chapter describes the rubric for the SABER-EMIS Tool and gives a brief overview of an EMIS benchmarking pilot, which demonstrated the feasibility of the concept. The last chapter describes how an EMIS is benchmarked, scored, and subsequently leads to a situation analysis. This assessment sequence provides an understanding of the strengths and weaknesses of an EMIS system for a fuller, more comprehensive depiction of its status. Overall, this paper evaluates whether a management information system is set up to use the information it generates for improving operational efficiency and educational quality.

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Acronyms

API	application programming interface
Ed-DQAF	Education Data Quality Assessment Framework
EMIS	education management information system
ESEA	Elementary and Secondary Education Act (U.S. law)
ICT	information and communications technology
ISCED	International Standard Classification of Education
IMF	International Monetary Fund
IOS	International Organization for Standardization
IT	information technology
MDG	Millennium Development Goal
NCLB	No Child Left Behind (U.S. law)
ODE	Ohio Department of Education
OECD	Organisation for Economic Co-operation and Development
OECS	Organization of Eastern Caribbean States
PISA	Programme for International Student Assessment
SABER	Systems Approach for Better Education Results
SEAT	SABER EMIS Assessment Tool
SEDL	Southwest Educational Development Laboratory (United States)
SIF	Schools Interoperability Framework
SWOT	strengths, weaknesses, opportunities, threats
UIS	UNESCO Institute for Statistics
UFE	Utilization-Focused Evaluation
UNESCO	United Nations Educational, Scientific and Cultural Organization

Introduction: The State of Education Management Information Systems

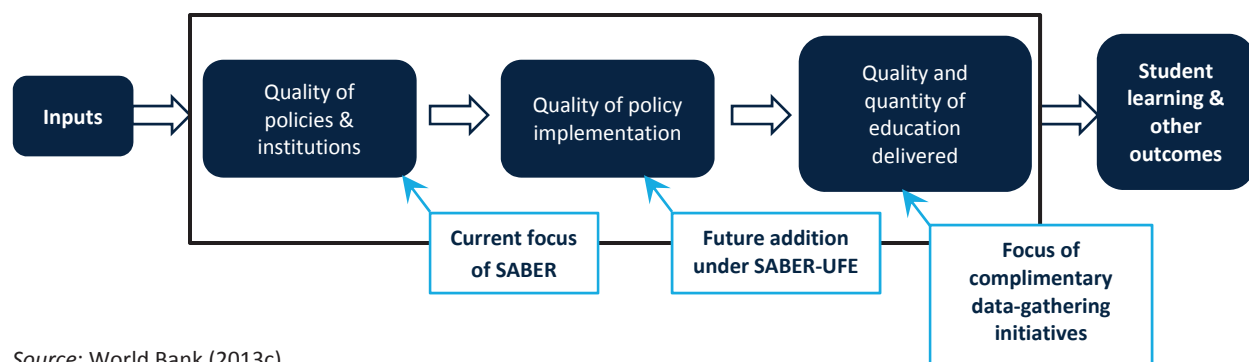
Assessing the state of education in a country demands information about the inputs, resources, governance, operations and outcomes of its education system. An education management information system (EMIS) provides systematic, quality data in a well-structured enabling environment that facilitates utilization of the information produced in planning and policy dialogue.

The main objective of this paper is to outline the framework for the SABER-EMIS Tool. The paper first provides an overview of current data-related demands for improving education and how an EMIS operates to meet those demands. It then outlines what currently exists in EMIS systems by reviewing EMIS activities and highlighting EMIS experiences that guide the benchmarking tool. The text discusses what matters in an EMIS by reviewing three guiding principles of such a system, as well as the theoretical underpinnings of the four policy areas that need to be assessed. This framework paper also delineates the SABER-EMIS tool, which includes instruments for data collection and a rubric for scoring, benchmarking, and analyzing its results. It explores how the results of the tool can be interpreted and used to guide the improvement of an EMIS. In sum, the paper evaluates whether a management information system is set up to use the information it generates for improving operational efficiency and educational quality.

Systems Approach to Better Education Results (SABER)

To support the implementation of its Education Strategy 2020, the World Bank’s Human Development Network/ Education launched the Systems Approach for Better Education Results (SABER) initiative in early 2011. SABER is designed to help governments systematically examine and strengthen the performance of their education systems so that all children and youth can be equipped with knowledge and skills for life. The initiative is based on the premise that while improving the quality of education requires actionable information, “there is far too little actionable, detailed knowledge about education policies and institutions available to policymakers and other education stakeholders” (World Bank 2013d, 4).

Figure 1. SABER and the Results Chain for Learning



Source: World Bank (2013c).

SABER fills in existing gaps in the availability of policy data, information, and knowledge about the factors that might influence educational quality (box 1) and about the variables that can be transformed to improve this quality (see figure 1 to understand how SABER conceptualizes education systems). SABER utilizes new diagnostic tools and policy data to enable governments to evaluate policies

through the lens of global evidence-based standards, helping them determine which types of changes and policies could be implemented to improve learning. As a result, a knowledge base is developed that policy makers and citizens worldwide can utilize to identify the reforms needed to improve learning outcomes. This SABER initiative seeks to provide standards of good practice against which countries can rate themselves by using a benchmarking tool.

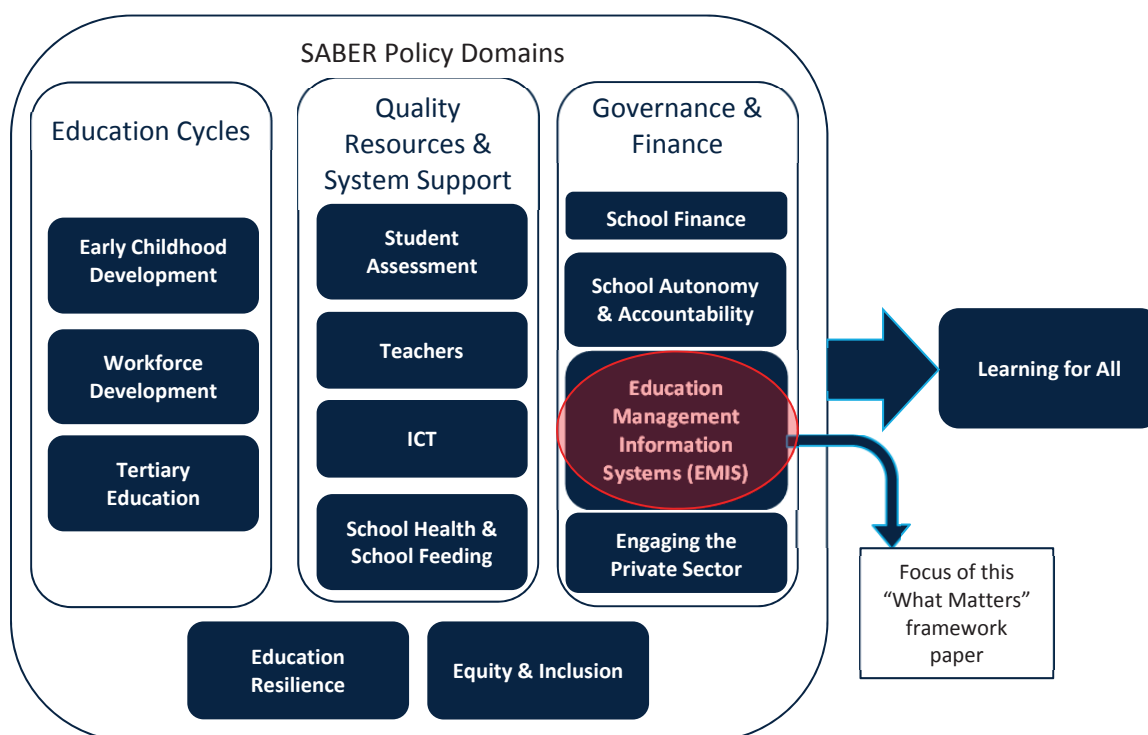
Box 1. Education Quality Defined

The overall goal of an EMIS is to improve educational quality, which is generally defined as including the preparedness of students to learn, the conduciveness of the learning environment, the relevance of learning content, the skill and training of teachers, and the linkage between students' educational outcomes and their positive participation in society. Educational quality is thus concerned not only with inputs (e.g., school attendance), but also with educational processes (e.g., teaching methods) and outputs (e.g., literacy and numeracy). While the World Conference on Education for All held in Jomtien, Thailand (1990), identifies quality education as a prerequisite for achieving equity, educational quality was highlighted in the 2000 Dakar Framework for Action as positively impacting economic and social development.

Sources: UNESCO (2005); Verspoor (2002); UNICEF (2000); *World Conference on Education for All* (1990).

SABER focuses on specific policy domains (figure 2); the toolkits associated with each domain are currently in a different phase of development and use. Countries select the SABER policy domains they find most valuable and relevant and work with the World Bank to apply SABER toolkits to their education systems.

Figure 2. SABER Policy Domains and EMIS



Source: World Bank (2013d).

Note: ICT – information and communication technology

SABER has been applied in more than 110 countries and its results have been analyzed (World Bank, 2014). Analyzing the strengths and weakness of these applications reveals gaps in information and data availability. This “What Matters” framework paper focuses on the SABER-EMIS policy domain. Improving the quality of education data is an important, actionable priority for policy makers. Citing the importance of data in PISA findings, Andreas Schleicher of OECD’s Programme for International Student Assessment (PISA) often notes, “Without data you are just another person with an opinion” (Ripley 2011). The presence of information and/or data about an education system will make SABER more effective. There is value in countries having the ability to benchmark their respective EMIS systems because this process allows them to rate their systems overall. As such, the EMIS domain is seen as an essential enabler of the SABER initiative.

The SABER-EMIS Tool

SABER EMIS policy domain

SABER’s EMIS policy domain aims to help countries identify how they can improve data collection, data and system management, and data use in decision making, thereby improving different elements of the education system. An education management information system is responsible for producing and monitoring education statistics within an education system. An EMIS has a multifaceted structure,

comprising the technological and institutional arrangements for collecting, processing, and disseminating data in an education system. It is crucial for tracking changes, ensuring data quality and timely reporting of essential information for planning and management, and for facilitating the utilization of information in decision making by policy makers. The system’s effectiveness is dependent upon its sustainability, accountability, and efficiency. A successful EMIS is credible and operational in planning and policy dialogue.

Box 2. Expert Opinion on Importance of Data and EMIS

“Student data isn’t the whole story, but it is a critical part of the story. Data underpins key aspects of our work. When that data is effectively collected, managed, and utilized, opportunities emerge that make the entire education system stronger.”

Source: Jack Smith, Chief Academic Officer, Maryland State Department of Education, United States. September 5, 2014.

The policy domain aims to eliminate the misconception often held by education stakeholders, namely, that an EMIS is simply a database or an Information Technology (IT) system. People are an important component of an EMIS in that they not only guide the collection, maintenance, and dissemination of data, but they also lead the transformation of data into statistics that are used to inform decision making. *In reality, an EMIS is a system that exists within the larger education system.*

Assessing education information systems

SABER-EMIS assesses education information systems with the aim of informing the dialogue on policies related to education statistics and indicators, as well as to help countries monitor overall progress related to educational inputs, processes, and outcomes. The policy domain executes this role in several ways:

- SABER-EMIS administers a set of tools, including questionnaires and a rubric for key informants, and gathers both qualitative and quantitative data (validated by legal documents) in order to assess the soundness of the information system.
- SABER-EMIS classifies and analyzes existing education management information systems based on four policy areas.

- SABER-EMIS produces country reports and other knowledge products with the intention of improving a country's education system.

Evaluating and benchmarking an EMIS

SABER-EMIS identifies four core policy areas that are shared by educational data systems and need to be assessed:

1. **Enabling environment:** Assessment of intended policies in relation to a sustainable infrastructure and human resources that can handle data collection, management, and access.
2. **System soundness:** Assessment of the degree to which the processes and structure support the components of a comprehensive information management system.
3. **Quality data:** Assessment of the degree to which an EMIS system accurately collects, securely saves, and produces high-quality, timely information.
4. **Utilization for decision making:** Assessment of the reality of system implementation and utilization of EMIS information in decision making.

For each education data system that it examines, the SABER-EMIS assesses progress in these areas using a four-level scale (latent, emerging, established, and advanced).

Approaches and methodologies

This tool adapts analysis tools—specifically, the International Organization for Standardization's series ISO 9000, the Education Data Quality Assessment Framework (Ed-DQAF), and Utilization-Focused Evaluation (UFE)—to evaluate an EMIS vis-à-vis the abovementioned policy areas. The findings of this evaluation are analyzed using SWOT (strengths, weaknesses, opportunities, threats) analysis to identify the strengths and weaknesses of an EMIS system. As a result, SABER-EMIS is an evidence-based diagnostic tool to evaluate data quality *and* the system itself in support of improving educational quality. It follows an indicators approach to focus on elements of the system that are observable and appraisable to an evaluator with knowledge of the structure and conventions of the agency in charge of statistics. It aims to evaluate those strengths, weaknesses, and key aspects of an EMIS that matter most for improving educational outcomes.

Users of the SABER-EMIS tool

This tool is intended for use by government education policy makers to assess policy areas of relevance to a country's EMIS and then benchmark them against international best practices. The tool's evidence-based framework is also envisioned for use by education system stakeholders to evaluate the intended policies behind an EMIS that govern its data quality, monitoring, and utilization in decision making.

Rationale behind the SABER-EMIS Tool

Value-added of an EMIS

An education information management system provides knowledge to education stakeholders about the status of the education system as a whole and the learning outcomes within a country. By using an EMIS, governments are able to analyze and utilize data to improve their education systems. The quality of education, a high-stakes education issue, has increasingly become the focus of education policy. Although EMISs have played an important role in the global effort to achieve universal education

coverage,¹ available evidence from test scores clearly shows that universal coverage is insufficient to produce an educated population. Efforts should accordingly shift to producing education of better quality (Mourshed, Chijioke, and Barber 2010). An EMIS helps generate the following valued-added components to improve educational quality:

- Data: Data and related education statistics are necessary to provide quality education.² “The achievement of good-quality education is dependent on the quality of statistics which inform the policy formulation, educational planning, management and monitoring processes” (Makwati, Audinos, and Lairez 2003, 9). The existence of data and a system to collect, maintain, and report it generates knowledge about the state of education in a country. For example, without the existence of educational data, it would not be known that more than 10 million children are out of school in Nigeria or that globally, 250 million school-aged children are failing to learn the basics in reading, or that the poorest girls in Sub-Saharan Africa will not achieve universal primary completion until 2086 (UNESCO 2014).

However, reliable, relevant, and easily accessible information about specific schools, teachers, enrollments, and educational outcomes is still lacking in many countries. Additionally, few countries have implemented quality assurance measures to check the quality, accuracy, validity, reliability, and usability of the data collected by their respective EMISs.

- Efficient expenditure: Information systems enable countries to be cost-efficient and effective in their education planning.
- Institutionalized data systems: When institutionalized and guided by a clear vision and strategic planning, an EMIS helps policy makers manage an education system to produce quality outputs. Unfortunately, many countries have invested resources in building education management information systems, but these systems are often not institutionalized, lack a guiding vision, and are not incorporated into strategic planning processes.
- Data-driven policies: Education management information systems are intended to help government experts design and implement policies. Unfortunately, most countries have not formulated policies on how to use EMIS data in planning and decision making. Even in countries where information systems are institutionalized, they are barely used to guide education policies (UNESCO 2003).
- Smart investments: One of the recommendations made by the World Bank’s Education 2020 Strategy is to invest smartly. One value-added dimension of an EMIS is that it empowers a decision maker to make smart spending decisions, based on data and analytics of investments proven to contribute to learning (World Bank 2011).

¹ In the case of universal coverage, policies previously focused on school infrastructure and improving net enrollment rates. Since school enrollment among children of primary-school age has become almost universal in many low- and middle-income countries, the current goal should be to ensure that children increase their level of learning.

² Statistics are raw data to which an algorithm or function has been applied.

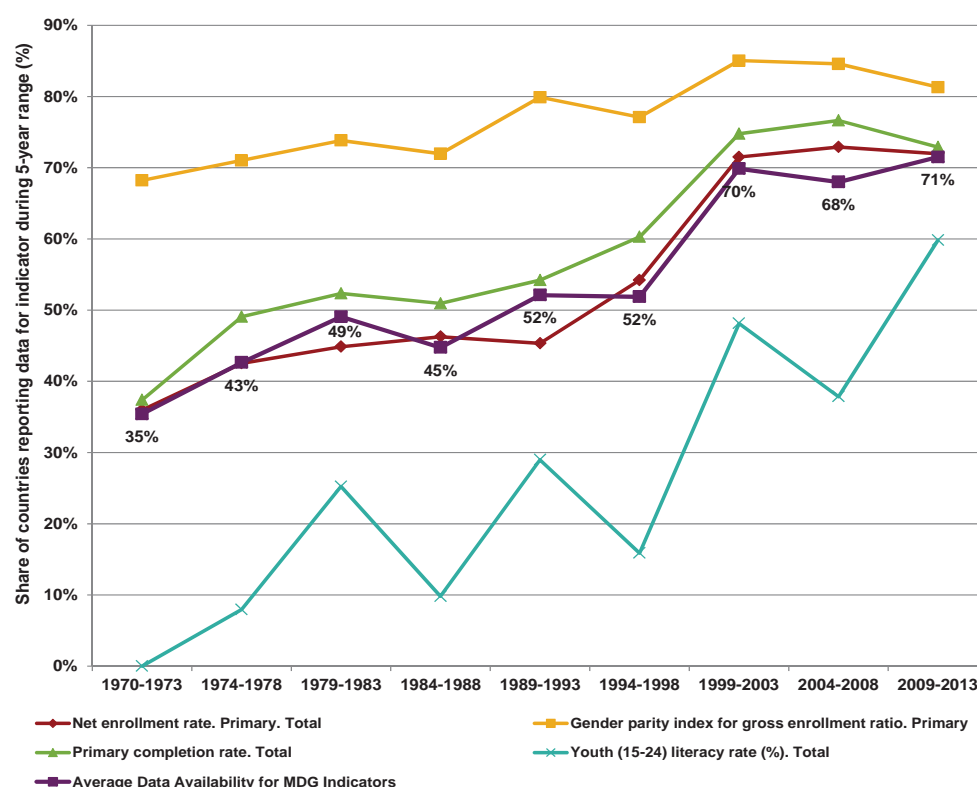
The need to benchmark

There is a critical need for a tool that can either assess a country's existing education information system or determine whether the country needs to establish a new system to generate the **abovementioned value-added components**. Such a tool would be based on areas of best practice and lessons learned, as identified by the international community, especially as they relate to the four policy areas described in this paper. A benchmarking system also allows policy makers to gauge the quality of their EMIS as well as how its education system compares to other systems internationally.

Currently, a data gap is hampering the ability of countries to conduct data-driven decision making in education policy. Crucial data is often not available and available data is often hard to use. This is a global issue that limits the ability of governments and the international community to monitor progress toward achievement of both the Millennium Development Goal (MDG) of universal primary education and the Education for All goals. An EMIS at the country level should be the primary mechanism for systematically monitoring progress toward and fostering accountability for reaching these goals.

However, in some countries, information systems do not exist or the indicators related to the MDGs and other educational goals are not being tracked systematically. Monitoring of international education statistics, moreover, presupposes the existence of reliable and complete education management systems at the country level (Cassidy 2006). Yet for the period 2009–2013, only 71 percent of developing countries reported the necessary data for four MDG indicators (World Bank Education Projects Database, 1998–2013) (figure 3); this compliance figure has not improved in recent years.

Figure 3. Low and Stagnant Reporting of Indicators



Source: World Bank EdStats calculations based on UNESCO (UIS) data, May 2014.

As the MDGs approach their sunset in 2015, the increased emphasis on educational quality, development, and performance presents policy makers at the country level with a multitude of policy choices. To reiterate, the production and dissemination of high-quality education statistics is essential for effective education sector planning, as well as to monitor progress toward national and global education targets. In other words, information is at the core of educational advancements. Ensuring equity and efficiency within education systems is, moreover, necessary to achieve learning for all. To track international indicators, national EMIS data must feed into other regional and international databases in a systematic, comprehensive, integrated, and well-presented manner.

Free and open databases are being made available to countries worldwide in an effort to utilize big data to inform education policies that improve learning outcomes. For example, the World Bank's revamped EdStats website is the first education statistics portal to present all publicly available education indicators (enriched with learning data) on one platform.³ The website includes general education statistics from the UNESCO Institute for Statistics (UIS), multiple indicator cluster survey data from UNICEF, and early grade data, plus demographic and health survey data from USAID and other institutions, including the SABER team at the World Bank. Other new platforms include the data visualizations of The World We Want,⁴ which combine big data on a range of development issues, including education. This latter online platform utilizes the results of consultations and discussions on the post-2015 agenda to engage policy makers on issues that are important to their respective constituencies.

The intended effects of EMIS benchmarking are policy changes that improve the quality of education and, ultimately, stimulate a country's economic growth. The shift in education policy from a focus on universal access to a focus on universal quality education is empirically supported by research, which suggests that the quality of education has a significant and positive impact on economic growth (Hanushek and Wößmann 2007). As a key component of social and economic mobility, education is a leading contributor to long-term poverty reduction (van der Berg 2008). An EMIS is a necessary element of an education system that enables policy makers to make critical modifications to the system in order to improve the quality of education. Benchmarking can reveal important lessons about the kind of changes needed in educational policies and institutions, such as:

- Learning must be measured and reported regularly;
- Teachers should be well selected, assigned, systematically incentivized, and well paid;
- Schools should have the operational autonomy to make changes that improve efficient use of financial and human resources; and
- Schools and the education system as a whole should be accountable for targets that they are assigned to achieve.

³ EdStats is available at <http://datatopics.worldbank.org/education/>.

⁴ See "Visualizing People's Voices" on the website of The World We Want at <http://millionvoices-data.worldwewant2015.org/>.

Chapter I: Setting the Scene

The overall goal of the SABER-EMIS policy domain is to help countries develop and refine their education management systems by identifying areas of improvement in data collection, data and system management, and the use of data in decision making. Despite considerable global efforts to improve the availability and quality of educational data, there is still much room for progress at the country level. “Many countries are hampered in conducting evidence-based policy making in education because they lack reliable, relevant, and easily accessible information about schools, teachers, enrollments, and education outcomes” (World Bank Education Management Information Systems website). This chapter explores the link between the rationale for a benchmarking tool and the policy areas that a country’s EMIS should benchmark.

Data-Related Demands to Improve Education

To improve education and increase learning outcomes, there is a clear universal demand for the right data, data-driven decisions, and a system to manage education statistics.

Demand for the right education data

There is a demand for the *right* education data. This means data that is comprehensive, relevant, reliable, and timely. In education systems overall, “there is a lack of data and information on policies at a more granular level, of the type that policy makers and stakeholders need when they are making concrete choices on how to promote education and learning for all” (World Bank 2013d, 5). While most governments collect some kind of data on their education systems, the reality is that critical data is often not available and available data is often hard to understand, analyze, and utilize. Therefore, there is a demand for data that can be easily utilized and integrated into existing systems to give a complete picture of the education sector, *and* that meets the needs of reliability and timeliness in order to make system-wide improvements.

Box 3. Examples of Prioritizing Data

Uganda: Uganda recognized the need to improve both its data collection processes and its production of education statistics reports. “During the period 2006 to 2009, the quality of data collected by the EMIS gradually deteriorated, response levels went down, and annual statistical reports stopped becoming available on a timely basis. USAID subsequently moved to re-assist the Ministry of Education to recover its performance in the EMIS area starting in 2010” (Bernbaum and Moses 2011, 25).

United States: EMIS data was prioritized initially through the Elementary and Secondary Education Act (ESEA) in 1965 and again in 2002, when the legislation was reauthorized as the No Child Left Behind Act (NCLB). Both policies prioritize and incentivize (through funding) the utilization of data and integrated data systems. While ESEA was more compliance focused, NCLB is part of a new wave of legislation that promotes the use of data in decision making and more innovative uses, such as state longitudinal data systems, which track student data over time and into the workforce.

Sources: Bernbaum and Moses (2011, 25); No Child Left Behind (2002); Elementary and Secondary Education Act (1965).

In order for data to be comprehensive, information gaps must be overcome. This can occur by continuing to improve school data and by exploring other data sources that could inform the education system. Data also need to be relevant to policy making and “easily understandable and interpretable” (Cassidy 2006, v). Obtaining these new sources of data requires that they be integrated into existing data collection systems for effective analysis. Reliable data needs to accurately reflect the current educational context and not be corrupted, so that wastage does not occur. Accurate and timely data is especially necessary to establish targets for and track implementation of sector support programs

financed by multiple donors. Lastly, decision makers require data in a timely manner in order to assess changes in educational quality (Bernbaum and Moses 2011). If information on the sector is late, erroneous, or simply not collected, optimizing the performance of an education system can be increasingly difficult.

Demand for data-driven decisions

There is a demand for education systems to make decisions on the basis of data.

As education systems move toward capturing education statistics at all levels and increasing accountability for improving educational quality, access to and use of education statistics becomes a necessary part of policy implementation and review (Kitamura and Hirosato 2009). Even before decisions are reached, there is demand

for data to inform the discussion process (Passey 2013). Policy makers often use education statistics as points of reference for political decisions, even in environments where the political economy of education suggests that policy analysis takes a backseat to political decision making in education (Crouch 1997). The goals of effectiveness, efficiency (including reducing costs), and equity drive the demand for evidence-based decisions.

Data-driven planning is more effective for an education system. This type of planning reduces system costs by more effectively allocating resources. Given that needed data exists and is timely, the added cost of improving this data is likely much lower than the implicit costs of bad information. Planning with old data inhibits optimal policy implementation, particularly with respect to resource allocation (Cassidy 2006). If enrollment data only becomes available nine months after a school year begins, there is little a government can do to reallocate teachers to improve student-teacher ratios across the school system for that year. Overcrowded classrooms will thus continue to exist while other classrooms nearby could be almost empty. The government response will be futile, coming one year too late. In addition, without the ability to verify or audit education system data, the volume of misallocated resources can be significant. If, for example, a government transfers resources based on enrollment and enrollment information is inaccurate, unnecessary funds will be spent.

Data-driven decisions also improve efficiency in an education system.

Education data is required to better understand the internal efficiency of an education system, as well as the social and economic variables that help explain student performance. For example, disaggregated student-level data on educational expenditures can help analysts evaluate the potential

impacts of changes in education budgets (Das 2004). Furthermore, the demand for data-driven decisions is supported by the efforts of SABER: “SABER allows education leaders and stakeholders to see inside

Box 4. Using Data to Guide Policies: The Case of Senegal

Based on data from yearly school censuses, researchers found that classes taught by female teachers had one more girl for every 10 boys than the same classes taught by male teachers. This finding, in conjunction with evidence from other sources, could guide education policy formulation in Senegal with an eye to further promoting gender equality in the education system.

Source: Makwati, Audinos, and Lairez (2003).

Box 5. Ghost Students

The issue of “ghost students” occurs in different contexts and leads to waste in an education budget. The “ghost student” problem is not unique to developing countries. In the U.S. state of Arizona, where education funding is allocated on a per-student basis, it has been estimated that eliminating ghost students would save \$125 million per year in the state education budget.

Source: Butcher (2012).

the black box between education inputs and outcomes, so that they can use evidence to strengthen education systems” (World Bank 2013d, 10).

Lastly, data-driven decisions are strengthened by the identification and targeting of various inequities within an education system. Data can highlight differences between specific groups and allow decision makers to design policies that ensure equity (e.g., equitable division of resources, gender equity, etc.).

Demand for a system to manage education statistics

Due to the complexity of education data, an institutionalized solution is needed that looks at the whole education system in a comprehensive, structured, and systematic manner via statistics. Governments suffer from a lack of information about their education systems, yet they need to manage information related to the system, answer policy questions, and respond to changing reforms in the system. A system of this type informs policy interventions related to high-stakes questions, such as “What is the impact of teacher qualifications on student performance?” In recent years, many countries have substantially reformed their education systems by collecting more data at local levels and using performance indicators and measurements of learning outcomes in order to monitor educational performance (Bruns, Filmer, and Patrinos 2011).⁵ This demonstrates the importance of collecting information on performance at subnational levels in relation to education targets, outcomes, and costs. Because of these developments, a system to collect, maintain, and disseminate timely and relevant information about the education system is critical.

An Effective EMIS

As an integral component of the education system, an EMIS responds to these data-related demands. This framework paper aims to demonstrate that a set of functionalities and components of an EMIS are required in order for the system to be effective. It assumes that the entity responsible for producing education statistics has the ability to collect, process, and manage data more effectively with an EMIS than it would without such a formal system. In

Box 6. Scope of EMIS

For the purposes of this paper, the scope of an EMIS is limited to basic and secondary education, that is, formal education in public and private schools. Tertiary education is beyond the scope of this framework paper. Available data at the school level on early childhood development programs and/or kindergarten may also be collected and included in a basic education EMIS.

the era of open data, it is increasingly possible to integrate, organize, and analyze data under the umbrella of EMIS. This section provides an overview of what is required to meet these demands. It informs the policy areas of “What Matters” and evaluates an EMIS within the SABER framework outlined later in this paper.

Multifaceted system

An Education Management Information System is a multifaceted, institutionalized system consisting of technological and institutional arrangements for collecting, processing, and disseminating data in an education system. In short, a successful EMIS cannot exist in a vacuum. A comprehensive EMIS is described as “a system of people, technology, models, methods, processes, procedures, rules, and regulations that function together to provide education leaders, decision makers, and managers *at all levels* with a comprehensive, integrated set of relevant, reliable, unambiguous, and timely data and

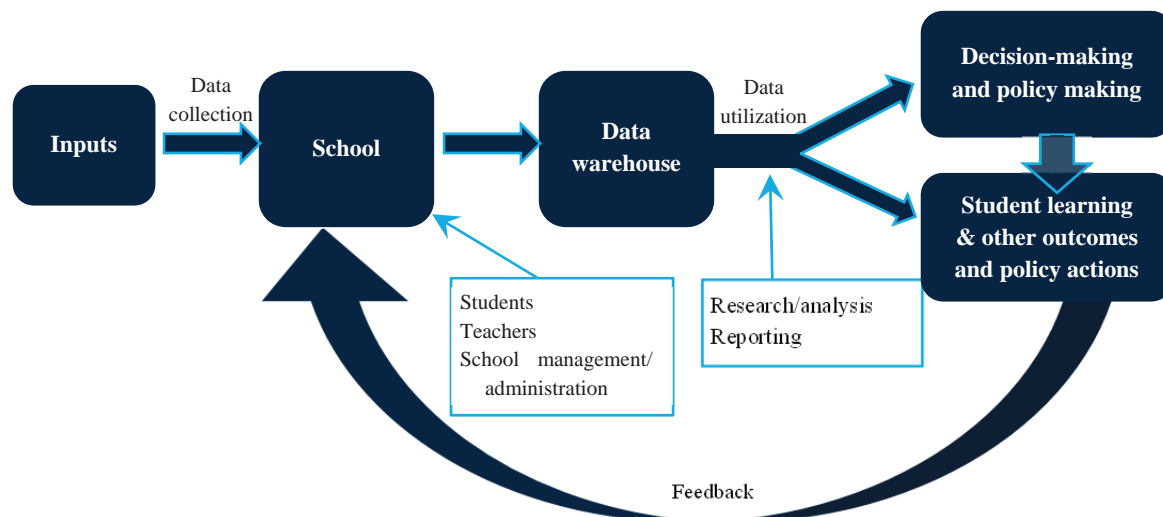
⁵ Indicators are a subset of statistics that provide information about a particular area of performance. For example, enrollment statistics are an indicator for access to education.

information to support them in completion of their responsibilities” [emphasis added] (Cassidy 2006, 27). An EMIS serves the needs of multilevel stakeholders to inform monitoring, analysis, and decision making in the education system (UNESCO n.d.).

An information cycle

The collection, maintenance, analysis, dissemination, and utilization of education data in an EMIS occur in a cyclical manner which is referred to in this framework paper as the “EMIS Information Cycle” (figure 4). An EMIS functions as a layer parallel to the Results Chain for Learning—which essentially outlines the theory behind the SABER framework—and covers the whole learning chain (figure 1 above). The system keeps track of inputs and helps assess the quality of policies and institutions, ultimately informing decision makers on student learning and other outcomes and policy actions. Information produced by the system is provided back to the data provider (e.g., schools) to be reviewed, acted on, and improved. This also includes feedback on improving the effectiveness of the EMIS information cycle itself. Feedback about the collection and analysis process then informs the next information cycle (Al Koofi 2007).

Figure 4. EMIS Information Cycle



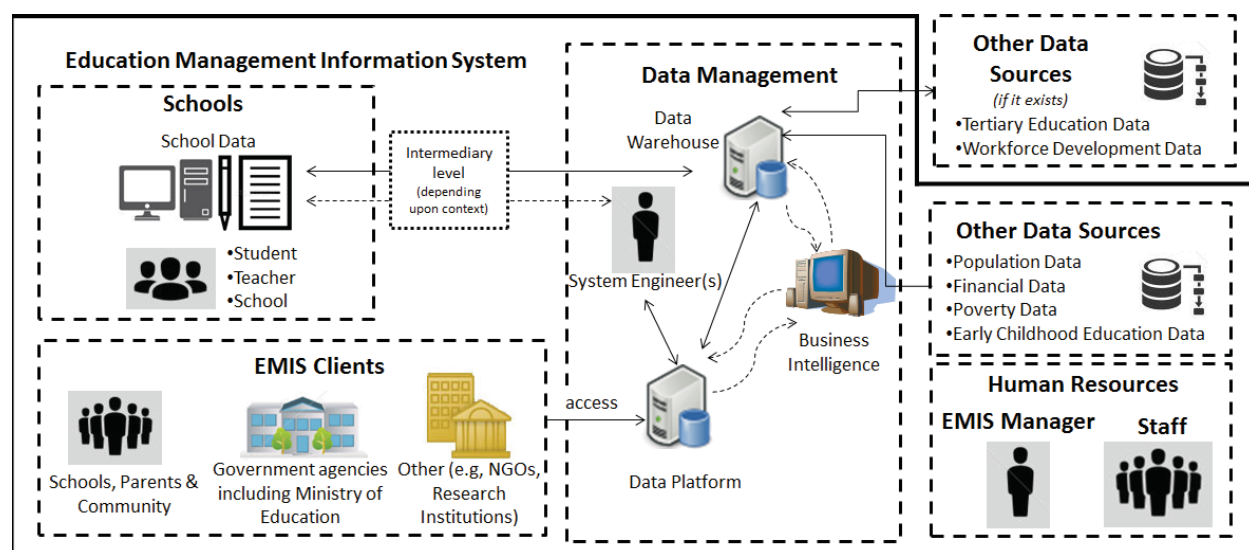
Source: Authors.

An effective EMIS is one that has a fully functioning information cycle. This cycle demonstrates that an EMIS is more than a simple annual school census, that the coverage of statistics goes beyond administrative census data. An EMIS is a dynamic system that has a defined architecture, the capacity to perform analytics, and the ability to serve its users. The functioning of this cyclical process results in more effective data sharing and coordination.

The functionality of an EMIS is universal across contexts because data is the core of its operations. However, an EMIS may look different among countries depending upon the context in which it operates because of differences in how data is collected and processed. Data collection tools may differ due to differences in available technologies. Analytics can be performed on the data using business intelligence

techniques,⁶ and data visualization tools and dashboards can be used to better understand the results of these analytics. An EMIS database can simply be an updated, computerized statistical information system or an administrative, function-specific database. In some contexts, an EMIS is often the result of “an accumulation of largely unrelated applications, some computerized and some manual, that grew from largely unrelated project initiatives” (Cassidy 2006, 2). Also, EMIS tools and technologies may be specific to contexts in poor, post-conflict, and/or small states (including Small Island Developing States), yet data is still intended to be the center of EMIS procedures. Figure 5 depicts how data is gathered, maintained, and shared in an EMIS, as well as how it is coordinated by users through the EMIS infrastructure.

Figure 5. Data Sharing and Coordination in an EMIS



Source: World Bank.

In some contexts, there is an intermediary level between schools and data management, depending on which level of government manages education data (e.g., county-level versus state- or provincial-level management versus federal-level management). These differences occur because countries are increasingly moving away from a centralized system towards a decentralized system in which the creation of education statistics occurs at the school, district, and regional levels (Adam 2011). This shift results in increased demand for data at lower levels

Box 7. Decentralized EMIS: Opportunities and Challenges

Government at the highest policy level needs education data. A decentralized education system lends itself to a decentralized EMIS with education management situated at the state, county, or local level in addition to the federal level. This arrangement allows clients at the school level (e.g., schools, parents, and communities) to more easily access information on a given school’s academic and financial performance. It also allows the education system to respond more effectively to these clients and therefore increases the governance and management authority of these clients and/or local governments. Lastly, schools can have their own education management systems, but such systems need to feed into higher levels of governance and a higher-level EMIS.

Sources: Winkler (2005); Winkler and Herstein (2005).

⁶ Business intelligence is a set of methodologies and technologies that use data analytics to transform raw/source data into useful statistics.

and the subsequent creation of intermediary levels (depending on the structure of the education system) developing their own information systems within a broader EMIS (Cassidy 2006). Regardless of how the system is structured, data needs to inform policy makers at the highest level so that it can inform their decision making.

Box 8. An Effective EMIS Unleashes Improvements and Innovation across the Education System

Once an effective EMIS has been designed and implemented, a world of opportunities becomes available. Several innovative tools are listed below, all powered by an effective EMIS.

- **Teacher-student data link (TSDL)** connects student academic growth and teacher training, qualifications, and practice. TSDL helps states and school administrators ensure teacher effectiveness and improve classroom learning practices.
- **Culture shifts** are reported by administrators, teachers, and students in which the existence of EMIS catalyzes the pursuit of professional development opportunities and even greater appreciation of ICT among students (Zain et al. 2004).
- **Improvements in management and leadership** abound when administrators have access to timely and reliable data. When administrators are equipped with an effective EMIS, they are able to make better decisions, plan ahead, and make smart investments.

Source: Authors; Zain et al. (2004).

Data coverage

The coverage of statistics in a system falls into two categories: raw information and aggregate figures. An education management system maintains raw information on the education system, such as payroll, teacher qualifications, human resources, and finance. It also contains aggregate figures derived from data, such as enrollment rates and completion rates. The availability of this second type of data provides a deeper understanding of the education system.⁷ An EMIS is not a kitchen sink that houses all data tangentially related to a country's education system. It is a system with fixed information that operates according to a specific logic, methodology, and well-defined purpose. Other data sources (figure 5) can be maintained in parallel to an EMIS such as poverty data, financial data, or early childhood education data.

Data use and effectiveness

An effective EMIS produces accessible education statistics that are both easily digestible and actionable for a variety of purposes. EMIS statistics are not limited to data collectors and statisticians, but instead are a useful tool for an array of clients. These users can access education statistics via designated platforms and/or dashboards that are standardized across the system or are customized depending upon the need (see annex A for an overview of EMIS users). EMIS data is used for evaluation and governance purposes primarily by schools, parents, communities, and governments. Education stakeholders use the data to produce policy notes, annual statistical reports, and a variety of reports that gauge student learning. In some cases, external organizations, such as nongovernmental organizations, utilize and promote effective data use in the education system.

⁷ Information typically captured by household surveys (e.g., students' ethnicity, literacy, gender, income level) may complement EMIS data and thus also be utilized in analysis and decision making.

Box 9. Overcoming State and Federal Divides to Ensure Effective Use of Data

The Data Quality Campaign (DQC) is a nonprofit, nonpartisan, national advocacy organization operating in the US. Like many World Bank client countries (e.g., Brazil, India, Nigeria, Pakistan, etc.), the U.S. education system is decentralized, with federal, state, district, and local school levels. DQC improves federal and state linkages and advances the effective use of data to improve student achievement through activities such as:

- Promoting development of state longitudinal data systems to collect and **utilize** data;
- Advocating for state policies that support **effective data use** and ensure *alignment* with local systems;
- Calling for federal policies that support state and local efforts to **use data effectively**; and
- Collaborating with partners to ensure that policy discussions are informed by high-quality data.

DQC's annual survey *Data for Action* examines the progress of the 50 states and the District of Columbia toward implementing *10 State Actions* (see actions below) to ensure effective data use. States are ranked and information is shared through DQC's transparent and interactive platform, creating an incentive for states to take action.

Action 1: Link data systems

Action 2: Create stable, sustained support

Action 3: Develop governance structures

Action 4: Build state data repositories

Action 5: Ensure timely access to information

Action 6: Create progress reports using student data to improve performance

Action 7: Create reports using longitudinal statistics to guide system improvement

Action 8: Develop a P-20/workforce research agenda

Action 9: Promote educator professional development and credentialing

Action 10: Promote strategies to raise awareness of available data

Source: Data Quality Campaign, <http://www.dataqualitycampaign.org/your-states-progress/10-state-actions/> (accessed May 1, 2014).

Cecil County in the U.S. state of Maryland demonstrates how accessible, reliable, integrated data can be used to identify at-risk students. Cecil County uses a sophisticated Academic Index to track factors that impact a student's success in school, such as Assessments (grades), Discipline (suspensions), and Attendance (absences). The Index is calculated by cut-off points, with 4 or more points displayed in **red** (need for intervention), 2-3 points displayed in **yellow**; and 0-1 points displayed in **green** (figure 6). Teachers gain greater insight into the classroom and can identify and respond to student needs. Reflecting on the system Regina Roberts, principal from Cecil County commented, "This is a system that builds off of what teachers already know individually and creates incredible value by aggregating that knowledge in an efficient, easy-to-use format. Teachers interact with information in a more dynamic way to address student needs. Principals and local school system staff have access to data that significantly shifts the way we do business, making it more efficient, reliable, and fast."

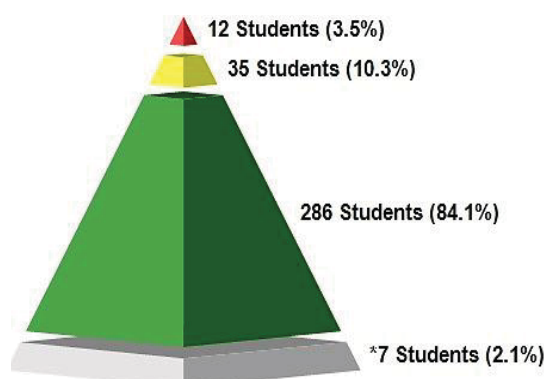
Figure 6. Academic Index Identifies and Tracks Student Needs

Assessments		
Grades (# of Ds or Fs)	0	0
Grades	1	1
Grades	2	2
Grades	3+	3
Discipline (Suspensions per school year)		
Suspensions	0	0
Suspensions	1	1
Suspensions	2-3	2
Suspensions	4+	3
Attendance		
Excused & Unexcused Absences	91%-100%	0
Excused & Unexcused Absences	85%-90%	1
Excused & Unexcused Absences	80%-84%	2
Excused & Unexcused Absences	0-79%	3

Academic Index – Marking Period 1

School Name
Current Grade: 6
Total Enrollment: 340

■ **High Risk** 12 students (3.5%)
■ **Medium Risk** 35 students (10.3%)
■ **Low Risk** 286 students (84.1%)
■ ***Not Available** 7 students (2.1%)



Teachers and administrators can view the Academic Index and the associated data via the Academic Dashboard, which can be generated for the following groups of students: grade, homerooms, classes, intervention groups, and cohort groups (figure 7). The Academic Index is highly actionable because it is calculated on a marking period basis, enabling students to improve their index if interventions are implemented and students respond favorably. For example, if a student has poor grades due to attendance issues, the school could implement an intervention that aims to improve the student's attendance and then track the success of that intervention through the Index (Cecil County Public Schools, Maryland, U.S. and Data Service Center, New Castle, Delaware, U.S., 2014).

Figure 7. Academic Index Dashboard

	Name	Current Plan	Student ID	HmRm	Programs	Acad. Index	Attendance			Discipline	Grading				ELA Teacher	Math Teacher	Race	Team
							Total AE	Total AU	Attend Rate		Grade ELA	Grade Math	Grade SS	Grade Sci				
Add Plan					504	5	34	18	61 %	0	D+	F					5	
Add Plan						5	10	28	71 %	0	D+	F	F	C-			5	
Add Plan						6	20	12	76 %	6							5	
Add Plan						5	10	2	52 %	0	C	F	D+	D			5	
Add Plan					Special Education	6	20	4	82 %	6	B-	F					5	
Add Plan						5	6	30	73 %	0	C	C-	F	D+			7	
Add Plan						4	8	14	83 %	0	B-	C-	F	D+			5	
Add Plan					Special Education	7	0	28	79 %	3	D+	F	C-	D			3	
Add Plan						6	8	22	77 %	0	D	D+	F	F			5	
Add Plan						4	77	3	39 %	0	C-	B-	D	C-			5	
Add Plan						4	16	6	83 %	0	F	C-	F	D+			5	
Add Plan					Special Education	5	6	10	87 %	3	D	F		B-			3	
Add Plan						5	23	12	73 %	0	C-	D	F	F			7	
Total: 13																		

Source: Figures 6 & 7 provided by Cecil County, Maryland, U.S. and Data Service Center, New Castle, Delaware, U.S.

An EMIS makes it possible to set targets for and track the results of an education system. Thus, a well-functioning EMIS is a critical component of an effective and equitable education system. When a government commits to building and improving an EMIS, it moves past the use of ad-hoc surveys and basic education statistics to a more standardized, methodical, and scheduled approach to data collection and analysis. As previously mentioned, the EMIS of most countries does not complete the feedback cycle. For some developing countries, introduction of an EMIS into the education system is a recent occurrence. It is therefore important to understand what kind of education management information systems currently exist.

An EMIS in Action

The education management information systems that currently exist in developing countries are often not fully functioning, or are only addressing fragmented pieces of the education system. Of the operational EMISs reviewed, few were effective.

EMIS activities

A cursory review of education management information systems found few examples of education systems with a fully functioning, effective EMIS. In reality, most governments have education plans and policies, but few have implemented a monitoring system that actually allows them to track progress toward achieving the objectives of these plans and policies. Because there is little understanding of what kind of education management information systems currently exist, there is a need to benchmark them.

Three facts are known about the existing education management information systems internationally:

- **Efforts are being made to improve education management systems.** For example, the World Bank financed 232 EMIS-related project activities in a total of 89 countries from FY 1998 to FY 2013 (World Bank 2013d).

- **There have been advances in education management information systems, but most education databases simply produce statistics in a manner that is not accessible, complete, nor able to perform data analytics.** As indicated in Cassidy (2006, v), it is still the case that certain existing systems are solely “using results of school censuses and/or surveys that are usually published in bulky statistical yearbooks, often raw, fragmented, and with little or no analysis.” For example, in some contexts, existing EMISs have data, but the data is not of good quality and is not used to drive policy decisions.
- **Education management information systems use different approaches to collect, maintain, and disseminate data.** Different country contexts mean different needs and different access to infrastructure, ranging from intensive technological solutions to pre-packaged systems (complete with supporting materials and telephone support) to open-source technology.⁸ These different systems range in cost and effectiveness, but they all have the potential for incompatibility with existing regional and national information systems (Cassidy 2006). Regardless of the infrastructure, the focus of an EMIS is on its functionalities. Therefore, a data availability challenge remains, despite increasing use of information and communications technologies (ICTs) in education management systems. Additionally, even in education systems that have an EMIS in place, it is common to find that the system does not capture data on key education indicators that could support the improvement of educational quality. Benchmarking an EMIS will thus enable a country to better evaluate its system, while allowing the international community to better understand the education management systems that currently exist.

In an effort to understand what exists, the authors of this report reviewed varying education management information systems in order to develop the benchmarking criteria for the SABER-EMIS framework. It was critical to understand systems perceived as effective. In addition, it was important to examine examples of best practices from intensively used education management information systems in order to gain insight into what actions can be taken to improve underdeveloped systems. The examples discussed below were chosen to highlight both specific EMIS functionalities and demonstrated system results. The section is thus intended to provide a flavor of different EMIS experiences. Learning from these best practices is not just necessary for developing countries, as there is still room to improve education information systems in developed countries as well.

Improving learning outcomes

Ohio, United States. The U.S. state of Ohio is a prime example of how a government, in this case at the state level, decided to utilize an EMIS as a starting point for improving learning outcomes. The state’s EMIS has four key functions: state and federal reporting, funding and distribution of payments, academic accountability, and generating statewide and district reports. Starting in August 2007, the Ohio Department of Education (ODE) redesigned its EMIS to focus on data collected by the Information Technology Centers to the Department of Education, using a vertical reporting framework. It also

⁸ While it is still in the development phase and has not yet been used in practice, the newest EMIS initiatives are open-source systems with dedicated applications and tools. For example, OpenEMIS, an open-source EMIS tool developed and supported by UNESCO, is in theory a royalty-free system designed to be adapted to meet the needs of different users. The latest release of this system occurred on March 1, 2014; it can be downloaded at www.openemis.org. The UNESCO Amman Office is “customizing the software for the Ministry and facilitating the transition of the system onto OpenEMIS” (UNESCO n.d.). However, this open-source EMIS is still a work in progress and a complete OpenEMIS product has yet to be delivered.

implemented the Schools Interoperability Framework (SIF) standard to exchange data between different applications.⁹ The following components of the state’s EMIS contribute to its functionality (Ohio 2014c):

- *Legal framework:* The EMIS was established by law in 1989 to provide the “architecture and standards for reporting data to the ODE” (Ohio 2014b, 1).
- *Methodological soundness:* The soundness of the system can be seen in the current EMIS Manual on the ODE website (Ohio 2014 n.d.).
- *Source data:* Demographic data, attendance data, course information, financial data, and test results are gathered for primary and secondary schools. After every EMIS processing, the ODE releases a data verification report to the Information Technology Centers. This helps ensure that data have been reported accurately. In addition, statistics are available over a sufficiently long period of time. For example, time series data on average teacher salaries (by district) are available going back to 1998.
- *Transparency:* Each dataset or statistical release that is published online is accompanied by the phone number and e-mail address of the EMIS staff member who can be contacted for further enquiries. In addition, the ODE website highlights frequently requested data, showing that all users’ needs (i.e., not just the government’s needs) are kept in mind throughout the process of data collection, management, and dissemination (Ohio 2014 n.d.).
- *Professional development:* ODE trains its EMIS staff, posting handbooks and professional development presentations online.
- *User awareness:* Documentation detailing changes to the EMIS are electronically archived for the public.

Because the EMIS in Ohio is a comprehensive system, using it as a comparative model provides further insights into what steps can be taken to upgrade an underdeveloped EMIS.

Improving data collection, management, and utilization

United Kingdom. The United Kingdom’s Department of Education is improving its collection and management of education information through the aggregation of data. Its £31 million School Performance Data Programme will be delivered in 2015 and will:

- consolidate eight existing data-based services;
- maintain “one single repository for all school data — bringing together for the first time school spending data, school performance data, pupil cohort data, and Ofsted judgments in a parent-friendly portal, searchable by postcode” (U.K. Department for Education 2012, 22); and aim to increase school accountability by allowing parents to “easily compare and analyze different schools’ performance” (du Preez 2012).

Box 10. Interconnectivity with Different Systems

The My School 2.0 portal in Australia is intended to be used in conjunction with other databases, such as “My Skills” and “My University,” which were launched in 2012. These websites focus on connecting individuals and employers, on one hand, and students and tertiary education institutions, on the other. The respective systems are thus interconnected, demonstrating how data sources outside of an EMIS (e.g., tertiary education) can be utilized.

Source: OECD (2013).

⁹ Redesign documents are available online at the ODE website at <http://education.ohio.gov/Topics/Data/EMIS/EMIS-Documentation/Archives/EMIS-Redesign-Documentation>.

Box 11. Encouraging Schools to Provide Data

In addition to Ohio, the U.S. state of Massachusetts is using a School Interoperability Framework (SIF) “to integrate already existing data collection systems and provide grant opportunities for local school districts to participate in the SIF initiative.” These activities are part of the federal government’s Race to the Top Initiative to both encourage schools to provide data and demonstrate how policies are informed by data. Implementation of the SIF was made possible in part due to a \$6 million State Longitudinal Data Systems grant from the U.S. Department of Education, which aimed to improve data collection by introducing new technology. Weekly updates have been provided on the website since February 1, 2013, regarding the SIF rollout, making the development of the system transparent and accountable to the state.

Sources: Massachusetts (2014); U.S. Department of Education (2013).

Australia. An excellent example of how the dissemination of quality information can be used to improve accountability is found in Australia. The Australian Curriculum, Assessment, and Reporting Authority developed a needs-based model to increase the accountability of the education system by creating an online portal called “My School” in 2010.¹⁰ The portal offers the first ever profiles of Australian schools (specifically, “government and non-government school sectors that receive funding from governments through either the National Education Agreement or the Schools Assistance Act 2008”), including educational outcomes, student populations, and capacity or capability (ACARA 2014, 2). These profiles are used at the individual school level, enabling schools to compare their data to national data on performance in specific competencies. Information regarding confidentiality clauses, data validity, and reporting are also made available to EMIS clients. The six-year phase-in and recent update of My School 2.0 are focused on developing a sustainable system (OECD 2013).

Box 12. Improving Service Delivery in the Philippines

The Affiliated Network for Social Accountability in East Asia and the Pacific (ANSA-EAP) Foundation, Inc., and the Department of Education (DepEd) for basic education in the Philippines established the website “checkmyschool.org” as a participatory initiative to promote social accountability and transparency. The initiative, which aims to improve the delivery of information about public education, combines digital media via websites, social media, and mobile technology with community mobilization via partnerships with education stakeholders. Cognizant that Internet penetration in the country is only 25 percent, the designers of the website added an SMS reporting tool and created a network of “infomediaries” (information intermediaries)—volunteers from the community who could help parents and teachers use the platform to find solutions to their problems. Overall, the initiative allows communities to be involved in the monitoring of data collection and take ownership of the data.

Source: ANSA-EAP website, Manila, Philippines, <http://www.checkmyschool.org/> (accessed July 30, 2014).

Pakistan. Pakistan provides an example of how the utilization of EMIS data in specific action plans can improve education service delivery outcomes in a decentralized system. Pakistan’s EMIS is housed within the federal Ministry of Education, specifically, within the Academy of Education Planning and Management. The system receives data from four provincial education management information systems. Each province maintains a distinct organizational structure and data collection questionnaire. EMIS data was used to identify the 30 lowest-performing primary schools in 10 districts. Performance

¹⁰ See <http://www.myschool.edu.au/>.

management techniques, action plans based on validated school data, and district status reports were then used to improve the schools' performance levels and led to the improvement of education service indicators. A few factors—such as the use of familiar data, decision making at the local level, the existence of a district-level EMIS, and the use of incentives to improve data quality—contributed to the success of this intervention. Because data was used to drive decision making at the district level, system challenges at the national system level were circumvented (Nayyar-Stone 2013).

Box 13. Malaysian Smart Schools Prioritize EMIS and Reap Rewards in School Management

The 1999 Smart School Policy (SSP) was part of the Malaysian government's plan to transition from a production-based economy to a knowledge-based economy by 2020. The policy included a computerized Smart Schools Management System (SSMS) with services such as systems integration, project management, business process re-engineering, and change management. An analysis of 31 residential Smart Schools found:

- Improved accessibility of information used to support teaching and learning processes (96.8 percent);
- Better utilization of school resources (96.8 percent);
- More efficient student and teacher administration (93.5 percent); and
- A better and/or broader communication environment for the schools (80.6 percent).

Several years later, a Smart Schools impact assessment found that select governance and management modules from the management system improved resource management, planning, and productivity.

Sources: Zain, Atan, and Idrus (2004); Frost and Sullivan (2006).

Maryland, United States. The U.S. state of Maryland provides an example of how the availability of data resources can lead to increased accountability and improve the quality of education. The Accountability Branch of the state's Department of Education maintains the education data warehouse and "collects, validates, and compiles data from local school systems for local, state, and federal reports" (Maryland State Archives 2014).¹¹ School report cards are then issued and made available for the purposes of accountability, assessments, demographic tracking, and graduation.¹² Data support resources (e.g., improved instructional and curricular resources and professional development courses) are also provided via a Blackboard platform to enable educators to analyze EMIS data and improve instruction, help students improve literacy and prepare for college and careers, and allow parents to understand common standards and achievement testing (Maryland n.d.).

Box 14. Improving Cost-Effective Planning

Fairfax County in the U.S. state of Virginia utilizes EMIS data to inform cost-effective planning. Between FY10 and FY15, the increase in student enrollment will require an additional \$25.8 million in school-based resources. On the basis of EMIS data and projected enrollments specified in the State School Efficiency Review, one proposal recommended eliminating 468.7 classroom positions by "increasing class sizes and reducing needs-based staffing, instructional assistants, and the career and transition program." To address larger class sizes, a staffing reserve of 20 positions would be added, with overall staffing increases offset by enrollment growth and turnover. The budget change would account for 2 percent, or \$36 million, of the total county classroom budget.

Source: Fairfax County Public School District (2014).

¹¹ The Accountability Branch, formerly the Statistical Services Branch of Maryland's State Department of Education, was transferred to the Division of Curriculum, Assessment, and Accountability in July 2013.

¹² Maryland school report cards are available online at <http://msp.msde.state.md.us/>.

Maryland was also among the first states in the country to receive a Statewide Longitudinal Data System (SLDS) Grant from the federal government (box 15). The Maryland State Longitudinal Data System (MLDS) is a policy-based system designed to answer 15 education-to-education and education-to-work transition, readiness, and effectiveness preparation policy questions. MLDS links together data for Maryland students from preschool, through college, and into the workforce and tracks that data over time. Data supports continuous improvement of educational outcomes and research to increase student achievement and support accountability (Education Commission of the States (ECS) 2013).

Box 15. U.S. Prioritizes Longitudinal Student Data

The Statewide Longitudinal Data Systems (SLDS) Grant Program is a federal program in the United States that enables state grantees to design, develop, and implement SLDSs to efficiently and accurately manage, analyze, disaggregate, report, and use individual student P–20W (early childhood through workforce) data. Once implemented, SLDSs support continuity in learning by tracking and improving student transitions at each juncture. Long-term goals are to:

1. Identify what works to improve instruction;
2. Determine whether graduates are equipped for long-term success;
3. Simplify reporting and increase transparency;
4. Inform decision making at all levels of education; and
5. Permit creation and use of accurate, timely P–20W data.

For more on EMIS integration to support SLDSs, see figure 7. *Source:* Institute of Education Sciences website, U.S Department of Education, Washington, DC, <http://ies.ed.gov/> (accessed September 9, 2014).

Informing policy and planning

Queensland, Australia. The EMIS of the state of Queensland, Australia, provides a good example of how a well-functioning EMIS is vital to the effectiveness of policy and planning in an education system. Queensland’s Department of Education and Training collects, processes, and disseminates a wide range of data on the education system at six-month intervals. This publicly available information includes enrollments, budgets, attendance, class sizes, school geography, academic assessments, and student outcomes (such as post-schooling destinations). This data is critical for education sector planning. Reporting on student achievement requires standardized, comparable data on performance from all state schools, along with a synchronized data collection schedule. Without Queensland’s advanced EMIS, which generates relevant statistics in a timely and dependable manner, data-driven initiatives to improve educational quality would not be possible in the education system (Freebody 2005).

Improving school quality

Virginia, United States. The state of Virginia in the United States uses education data collected by its EMIS for school accreditation. The state’s Standards of Learning accountability program aims to provide school data related to student learning “by grade, subject, and student subgroup and information on other indicators of school quality” (Virginia n.d.). This data is communicated to schools, school divisions, and the state as a whole via school report cards. Results from assessments of core academic areas are provided in the form of school report cards and utilized to inform the annual state accreditation process (Ibid.) Test results and specific indicators are legally required to be provided to parents (Cameron, Moses, and Gillies 2006).

Box 16. Informing School-Based Activities

With the assistance of the nonprofit organization Southwest Educational Development Laboratory (SEDL), a school in Louisiana was able to address students’ diverse needs and foster school improvement in the 2010–11 school year, using data from the prior year’s assessments. A school in Texas was similarly able to analyze data, instruction, and school interventions.

Source: Lewis, Madison-Harrison, and Times (2010).

Chapter II: What Matters in an EMIS

Guiding Principles

Three principles guide an effective EMIS: sustainability, accountability, and efficiency. Lack of these principles leads to deficient systems. Combined, the principles result in an effective EMIS that adds value to an education system.

Box 17. Sustainability, Accountability, and Efficiency in an Information Management System in India

Although this example from Karnataka State in southwest India concerns land records, the relevant information management system has functionalities similar to an EMIS in that it collects, maintains, and disseminates information for different kinds of users. The Karnataka land records information management system, created in 1991, resulted in increased efficiency by decreasing the time required to obtain records, increased transparency in record maintenance, and increased accountability (by decreasing the use of bribes). Due to the system's success, the Indian government "suggested that other states consider similar systems to improve accountability and efficiency in services that are vital to rural households" (World Bank 2004, 87). The guiding principles discussed in this chapter can result in an EMIS system that has a similar impact on an education system.

Source: World Bank (2004).

Sustainability

Most countries with an EMIS are struggling to sustain their systems, which can negatively impact learning outcomes. Simply stated, "it is obvious that without sustainability there is no long-term use, and without long-term use there cannot be long-term impact on the classroom" (Crouch 1997, 214). "The three key components to successful creation of a sustainable information culture are reorientation of the education information system toward clients, improved capacity to use information at the local level, and increased demand for information" (Winkler and Herstein 2005, 1). Use of an EMIS could be limited due to incompatibility with existing systems, customization of new systems, the capacity of EMIS staff, limited financial resources, or limited government commitment. Additionally, if data are not used for decision making because they are not needed or are not relevant, this negatively impacts the sustainability of the system. As a result, the information loops within countries are not maintained and an EMIS is not sustainable.

Box 18. Evolution of an EMIS: From Compliance to Action

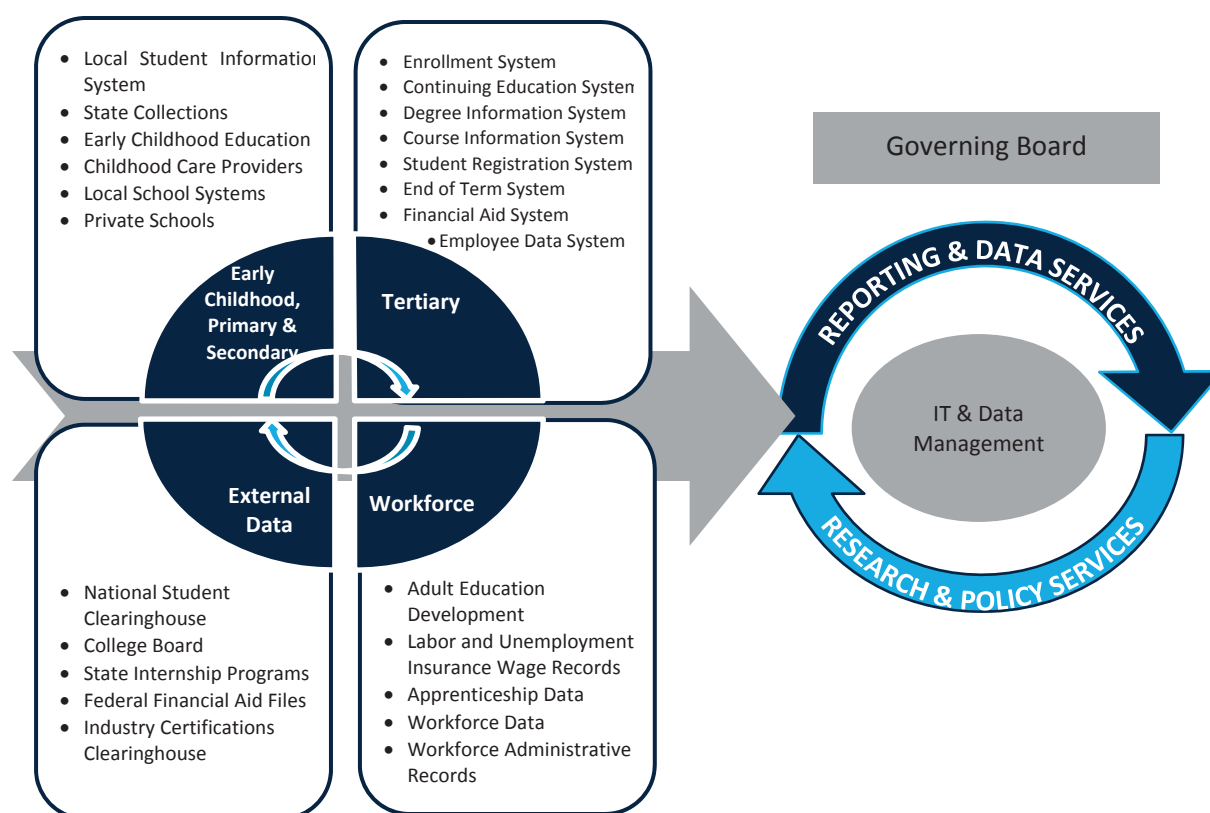
In many countries, an EMIS has evolved from student management systems focused on compliance to instructional data systems focused on learning and efficiency. The early systems focused on education inputs, such as number of schools, enrollment levels, and number of teachers. However, over the last decade, an EMIS has emerged as a critical foundation for effective and efficient decision making, accountability, and learning achievement, across (and even beyond) the education system and at every stage of learning, from early childhood education and into the workforce. Information systems are increasingly required to produce more complex information about educational processes and outputs, resource utilization, the effectiveness of new learning techniques, and the responsiveness of existing educational provision (Powell 2006).

This evolution is being observed in a variety of developed countries, many of which are now grappling with the challenge of integrating old and new systems, as well as re-engineering information flows from local to state to federal authorities. Less-developed countries have an opportunity to design modern, reliable, fully integrated, and sustainable EMISs from the beginning, thus leap-frogging cumbersome issues that stem from integration challenges between old and new systems.

Sources: Powell (2006); authors.

The U.S. State Longitudinal Data System (SLDS) Grant Program (box 15) is an example of what is possible when an EMIS is effectively implemented, integrated, and sustained. A state longitudinal data system integrates EMIS data from a variety of sources including: early childhood, primary, and secondary data; tertiary data; workforce data; and external data such as clearinghouses (figure 8). In the U.S., federal grants enable state grantees to design, develop, and implement SLDSs to efficiently and accurately manage, analyze, and report individual student P-20W (early childhood through workforce) data (Institute of Educational Sciences, n.d.).

Figure 8. State Longitudinal Data Systems Integrate Multiple EMISs



Source: Adapted from Education Commission of the States, “Maryland Longitudinal Data System”, (2013).

A multisystem approach to data management is problematic when databases are neither integrated nor compatible. Technological standards regarding integration and compatibility are necessary to ensure sustainability and proper system use. Lack of compatibility can ultimately impact the completion of an information cycle in which data influences policy decisions. There needs to be compatibility between an EMIS and existing database applications to ensure interoperability and the ability to customize, otherwise an EMIS will not be usable and therefore not sustainable. This is especially true when additional hardware and software applications are purchased from an external vendor.

Box 19. Incompatibility Between Reporting Forms

In Ghana, Mozambique, and Nigeria, the incompatibility between census forms and school records resulted in head teachers not responding to requests for data. Information was either difficult to calculate to make compatible with the form, incorrect, or no information was provided.

Source: Powell (2006).

The role of vendors is especially important when considering sustainability, as governments that procure specific tools may become “locked in” to a particular vendor, which may impede implementation of an EMIS. Utilizing a pre-packaged system can be advantageous because it can be customized to address specific contextual needs. However, such systems may not be sustainable if there is no understanding of system requirements, including the need for a licensing or a cooperative agreement with data providers (Cassidy 2006). To facilitate improved compatibility, public-private partnerships may play a role (e.g., in planning, implementation, contracting, procurement, evaluation, dissemination, and system migration) in sustaining an EMIS by supplying additional infrastructure, financial resources, and human capital. Additionally, development partners can assist in making systems sustainable by creating project-specific monitoring databases that are compatible with EMIS data; this would assist long-term, inclusive monitoring. In Yemen, this assistance is being sought to reduce the monitoring costs of development partners, as data from an improved EMIS can be used for comparison purposes (Yuki and Kameyama 2014).

High staff turnover makes sustainability a challenge. EMIS staff members tasked with data management and analysis need to develop the capacity to perform such activities in trainings. Actions to manage such staff and reduce turnover are also needed, as high turnover can be the result of gaps in basic human capacity. Moreover, as data collection occurs at the local level and school operations are computerized, it becomes difficult to meet large administrative demands from year to year (Cassidy 2006).

Countries finance the establishment of an EMIS because they understand the value of such a system; however, the required funding commitment is not always sustainable. When a system is purchased from an external vendor, for example, resources sufficient to maintain the system and pay for the licensing agreement are frequently lacking. Lovely (2011) describes this situation as follows: “There is often a sustainability problem, in that the recipient is often unable to afford to pay for the necessary support for the system. Donors will agree to cover the capital expense of the system development, but will not agree to cover the total life cost of a system.” The lack of financial resources can thus limit sustainability. From a supply-and-demand perspective, an EMIS often serves as the supply side of the information production cycle; however, consumption of EMIS products depends on demand. Demand for data and information is created when decision makers invest in dynamic data utilization tools that illustrate growth, trends, and relational implications. Lack of this type of investment prevents an EMIS from reaching its full potential (Hua 2011).

Box 20. Sustainability and a Successful System

The interconnectedness between a successful system and the need for sustainability is evidenced by the example of an evaluation of a newly created EMIS. Sudan implemented a national EMIS between September 2008 and December 2010; the system was evaluated in 2012. As the system was in its nascent phase, the evaluation findings indicated that it was likely to be sustainable “subject to completion of software development, production of enhanced strategic plans, reorganisation [sic] of ministries as required, especially the creation of a home for [the] EMIS in the federal ministry, government funding for operations and asset maintenance, [and the] provision of further external assistance for training and software completion.” These caveats demonstrate the importance of the issues related to overall EMIS sustainability.

Source: Smith and Elgarrai (2011, 7).

The sustainability of an EMIS is correlated with a government's commitment to the system. When there is consistent support for an EMIS at a high level of policy making, the importance of the functionalities are demonstrated to the public for the “achievement of the larger quality and performance objectives [of] educational development” (Cassidy 2006, 13). However, commitment may lag due to a lack of cooperation or inactivity on the part of key stakeholders. “As initial ‘champions’ become distracted or disenchanted, the odds of the EMIS effort stalling increase” (Crouch, Enache, and Supanc 2001, 49). Simply stated, if the government is committed to the system, the system is more likely to be sustainable. Hence, a policy and a clear legal framework on institutionalizing an EMIS will support system sustainability.

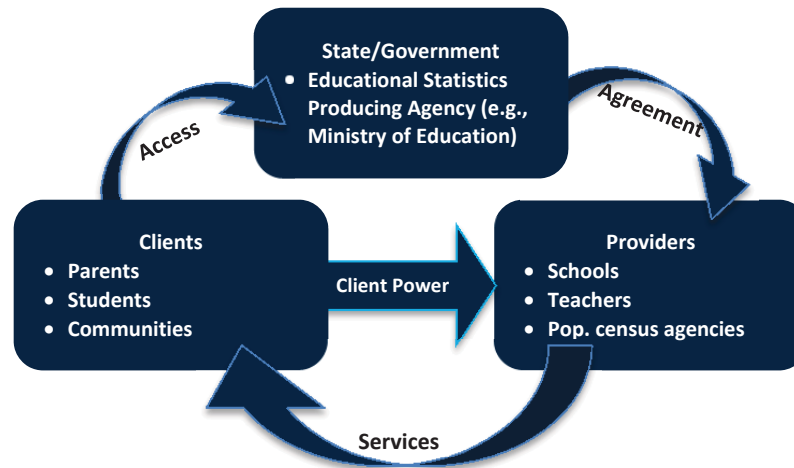
Accountability

Because decision makers need to rely on quality data, accountability is increased when these decision makers use the data to improve the education system. Accountability is considered a critical element of service delivery that influences the incentives of both the providers and recipients of information (Pritchett and Woolcock 2004). Before identifying data quality concerns, it is first important to identify where decision making occurs within a system to assess where accountability pressures exist (Crouch, Enache, and Supanc 2001).

Shared access to education statistics is an important lever for accountability. Published information about education performance is the central government's only tool for informing society about the performance of the education sector. Accountability is improved when accurate and reliable education statistics are made available. This helps ensure that decision and policy makers rely more on data than on politics and opinion (Porta et al. 2012). The quality and accuracy of data on education is therefore crucial, since only quality data will be trusted by society (Barrera, Fasih, and Patrinos 2009). By promoting more efficient and transparent use of resources, the combination of better-informed decisions and increased accountability paves the way toward producing better-quality outcomes in an education system (de Grauwe 2005).

Three accountability relationships exist among an EMIS, society, and education providers: the EMIS/state holds both policy makers and education providers accountable to society by requiring them to make informed data-driven decisions; clients hold the EMIS accountable for collecting, maintaining, and disseminating quality data and reporting on that data; and clients hold education providers accountable for providing quality education services. Figure 9 is adapted from a framework outlined by the World Bank (2004) regarding information and accountability relationships.

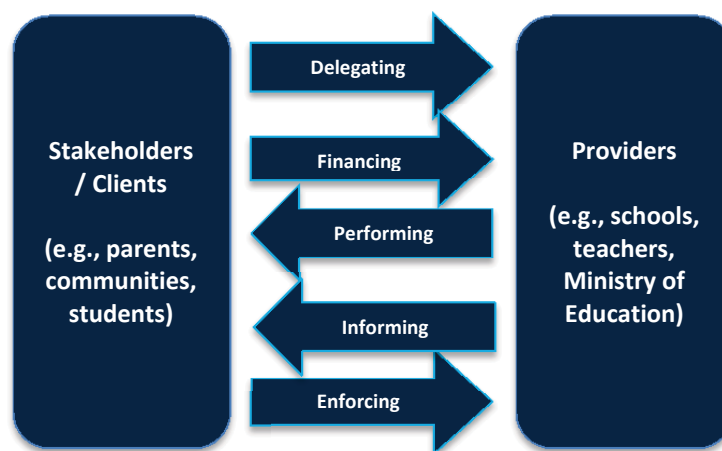
Figure 9. The Role of Information in an Accountability Framework



Source: Adapted from World Bank (2004).

Accountability relationships are complex due to individual interests and collective objectives, system monitoring requirements, and inherent difficulties in attributing outcomes to specific actions (World Bank 2004). Additionally, political accountability pressures occur primarily at the macro policy level where policy decisions are made, and less at the school level, which shifts accountability relationships (Crouch 1997). In addition, five features of accountability characterize the relationship between stakeholders who use EMIS data to inform their own decisions regarding the education system and the EMIS providers who run the system and make data-driven decisions to inform the functioning of the EMIS (figure 10).

Figure 10. EMIS Accountability Features



Source: Authors.

An EMIS provides information to clients and policy makers, helping them obtain financing and identify priorities. These two groups then provide feedback to schools about how to improve performance and increase efficiency. Of note, the underlying assumption of accountability relationships is that individuals adhere to ethical standards in working to improve learning outcomes.

The increasing existence of decentralized education management information systems—in which data serves high-level decision makers in addition to schools, parents, and local communities—inherently increases the accountability of an EMIS to users beyond decision makers. One example of how a culture of accountability can be created through decentralized reforms is found in Paraná State, Brazil (box 21). Transparency within the system, such as through report cards or parent councils (as highlighted in this example), enables accountability, which in turn sustains the relationship. In terms of financing, accountability is the best way to ensure the sustainability of a high-quality

education system, since good information permits, among other things, the identification and nurturing of teachers and programs that improve learning (Paul 2002).

Box 21. Culture of Accountability: Paraná State, Brazil

Between 1999 and 2002, Paraná State of Brazil implemented accountability in the education system through decentralization reforms. During this time, a “well-functioning” (as defined by Winkler 2005) EMIS existed; however, principals and teachers knew little about the education statistics of their own schools. A results-oriented management system with a focus on learning was accordingly implemented via school report cards and parents’ councils. Both measures increased the focus on learning outcomes and improving performance; the results of parents’ councils surveys were also included in the report cards to increase their visibility. It is thought that these accountability reforms are politically feasible because they are low-stakes reforms.

Source: Winkler (2005).

Efficiency

An efficient EMIS is necessary to support overall education management; inefficiency is a symptom of poor performance (World Bank 2004). Efficiency means effective maintenance of education statistics and records so that decision makers can plan effectively. In this context, the term efficiency refers to both internal and external efficiency. External efficiency here refers to the efficiency of an EMIS with respect to the education system as a whole. The demand for efficiency is highlighted in central government and regional action plans for education.¹³ Two issues relate to both types of efficiency: cost and technological means.

Data-driven decision making can result in more efficient spending. One of the motivations for governments to create an EMIS is to improve the internal efficiency of the education system, that is, to “address issues of redundancy or improved targeting of resources [which] typically require a greater degree of data accuracy and precision” (Crouch, Enache, and Supanc 2001, 46). By utilizing existing databases and data collection processes that are familiar to users while reducing redundancies, cost-efficiency is enhanced in the long term (Crouch, Enache, and Supanc 2001). Also, as noted in the new funding model for the Global Partnership for Education’s 2015–2018 replenishment campaign, there is a need to “develop better evidence-based policies and enable more efficient expenditure decisions” that “requires conscious and well-funded efforts to strengthen national information systems” (Global Partnership for Education 2014, 14).

¹³ For example, one of the action plan priorities of the African Union’s Second Decade of Education for Africa and the South African Development Community (SADC) education programme is an “efficient and well-documented information system to support education management” (UNESCO 2010, 5).

There has been an increase in the availability and use of ICTs to meet EMIS needs for data gathering and management, which leads to a more effective system. Existing databases need to be compatible to provide efficiency. For example, a review of education management information systems in Bangladesh, Ghana, Mozambique, and Nigeria between October 2005 and May 2006 indicated that “the lack of compatibility between databases or limited cooperation between government departments made it very difficult to produce the type of analytical data that can be used by policy makers” (Powell 2006, 16). While these countries have since shown improvement in producing analytical information, lack of compatibility previously hindered data-driven planning. Certain pre-existing tools are now being updated and/or borrowed from other sectors to advance the collection and use of data by such technological means as mobile phones and tablets. These means have been proven to increase efficiency (box 22). For example, an in-depth study is being conducted to collect school census data in Lagos, Nigeria, using tablet devices. Initial findings indicate that through the engagement of the private sector, the collection of school census data using tablet devices has decreased data collection costs and has added efficiency to the process because the data gathered in the field is entered virtually simultaneously into the data warehouse (Abdul-Hamid forthcoming).

Box 22. ED*ASSIST: Efficiency in Data Collection, Processing, and Reporting

The ED*ASSIST data collection tool developed by FHI 360 (formerly the Academy for Education Development, or AED) is being adapted from paper form for use on a tablet. The tablet application will collect information for budget development and effective resource allocation in the education sector. In Nicaragua and Benin, ED*ASSIST increased efficiency in their respective EMISs by reducing the “cycle of collecting, processing, and reporting national education data from years to months” (Sampson 2000, 58). The tool is currently being used in Djibouti, Equatorial Guinea, Liberia, Malawi, South Sudan, Uganda, and Zambia, with both the data and tool made available online at strategia.cc/ed-assist (see Bernbaum and Moses 2011 for a description of the tool’s use in Malawi and Uganda). As part of FHI 360’s Liberia Teacher Training Program II, which aims to address the shortage of qualified teachers and the capacity to produce new teachers, ED*ASSIST is also being introduced for biometric teacher attendance monitoring (FHI 360 n.d.).

Sources: Sampson (2000); Bernbaum and Moses (2011); FHI 360 (n.d.); ED*ASSIST website, <http://strategia.cc/ed-assist/> (accessed March 31, 2014).

While the increased use of ICTs is useful to improve the efficiency of an EMIS, technological means may not be necessary for a successful EMIS. Organizational and other factors may contribute to the efficient system performance of an EMIS beyond the use of ICTs. That is, ICTs are not the only determinant of an efficient EMIS.

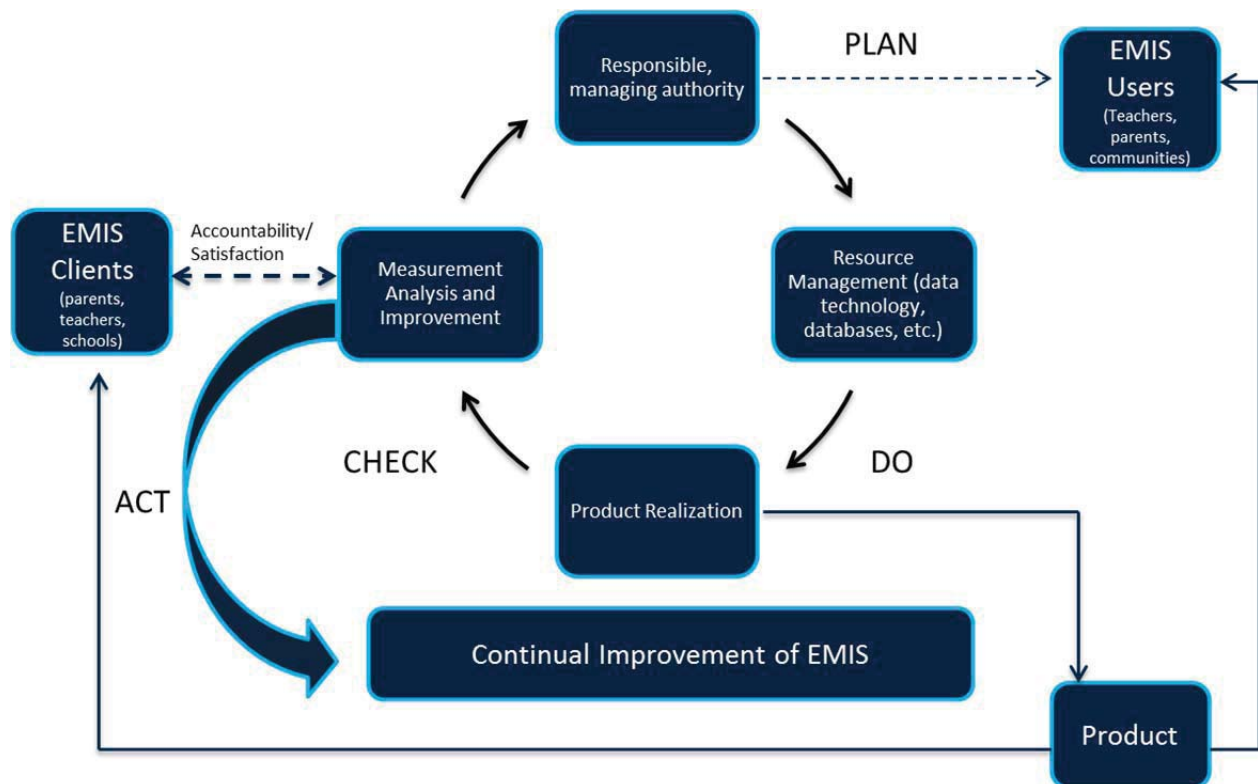
Construct Validity: Theoretical Underpinnings of EMIS Benchmarking

The above-mentioned guiding principles provide the construct validity of the SABER-EMIS Tool. Adding to the guiding principles discussed above, three tools—ISO 9000, the Education Data Quality Assessment Framework, and the Utilization Focused-Evaluation—form the construct validity of the tool, which is designed to assess the four policy areas discussed in the following section. Because these tools were not designed for benchmarking purposes, there was a need for a more objective scoring tool that would permit international and intertemporal comparisons. The text below introduces the three assessment tools in greater detail and provides a brief explanation of how they have been adapted to benchmark an EMIS.

ISO 9000

The standard typically used for quality management is the International Organization for Standardization (IOS) Series ISO 9000.¹⁴ The ISO 9000 focuses on the framework for quality management, providing guidance on how to manage for quality and perform internal audits (IOS n.d.). These standards have been applied to education and training institutes, including large organizations (Van den Berghe 1998). The ISO 9000 (2005, Principle 7) takes a factual approach to decision making based on analysis of data. This principle corresponds with the demand for data-driven decisions to which an EMIS responds.

Figure 11. Use of ISO 9000 Quality Processes to Assess the Soundness of an EMIS



Source: Adapted from ISO 9000, http://www.iso.org/iso/home/standards/management-standards/iso_9000.htm (accessed July 30, 2014).

In reality, the ISO 9000 framework is the backbone of an EMIS. Figure 11 adapts ISO 9000 to apply to the soundness (i.e., quality) of an EMIS. As outlined in the figure, assessing the management of an EMIS system ensures the continuity of operations. More specifically, the government (or an entity assigned by the government) is the managing authority responsible for the system, which manages its architecture and infrastructure and the realization of such products as statistical reports. Lastly, the system is analyzed for its continued improvement based on feedback from users and clients. In sum, these features allow for a sustained and effective system.

¹⁴ The ISO develops and publishes voluntary international standards for technology and business. Compliance with ISO standards can be certified by a third party.

Education Data Quality Assessment Framework

The Education Data Quality Assessment Framework (Ed-DQAF) is a comprehensive instrument used to benchmark the quality of education data. The International Monetary Fund (IMF) initially developed the generic Data Quality Assessment Framework (DQAF) to assess the quality of economic data (UNESCO 2010). The framework was then modified and adapted for the education sector in 2004 by the UNESCO Institute for Statistics (UIS) and the World Bank. Since then, it has been referred to as the Ed-DQAF (UIS 2014). Ed-DQAF is a flexible diagnostic tool that can assess the quality of essentially all education data produced by a government's education statistics agency. Its comprehensive evaluation compares education data quality within a country against international standards, allowing a country to identify areas in need of improvement (Ibid.). Ed-DQAF encompasses the parameters of many other professional standards established to evaluate data quality.¹⁵

The Ed-DQAF framework utilizes the prerequisites and five dimensions of data quality of the IMF's generic DQAF. Each dimension has distinct subcomponents, or “elements,” for which data is reviewed, with qualitative indicators in a cascading structure of three levels, ranging from the abstract to the specific (i.e., dimension, subdimension, indicators).¹⁶ The five dimensions of data quality are: integrity; methodological soundness; accuracy and reliability; serviceability (sometimes referred to as “utility”); and accessibility (UIS 2014, 14).¹⁷ These dimensions are combined with the prerequisites of data quality—specifically, the legal and institutional environment; resources; relevance and other quality management requirements—to provide a comprehensive analysis of data quality.¹⁸

Ed-DQAF is a viable framework basis for benchmarking the quality of education data in an EMIS. The original Ed-DQAF developed by UIS and the World Bank cites the EMIS as a potential system for which the framework could be adapted, specifically for “self-assessments performed by data producers such as Education Management and Information Systems unit in the ministry of education, and national statistical offices” (Patel, Hiraga, and Wang 2003, ii). Elements of Ed-DQAF are adapted to evaluate the enabling environment, system soundness, and data quality of an EMIS, as well as the use of data for decision making. Lastly, the cascading structure of the DQAF influences the structure of the benchmarking tool.

Utilization Focused-Evaluation

Utilization-Focused Evaluation (UFE), developed by Michael Patton, is based on the premise that an evaluation should be judged by its utility and actual use (Patton 2013). Therefore, evaluations should be designed and conducted in a way that ensures their findings are used. Even if an evaluation is

¹⁵ For example, the professional standards set forth by the American Evaluation Association Program Evaluation Standards (i.e., utility, feasibility, propriety, accuracy, and accountability) are analogous to the prerequisites and the five dimensions of data quality of the IMF's DQAF (Yarbrough et al. 2011). Also, the information quality guidelines that govern statistical information produced and disseminated by the U.S. National Science Foundation emphasize timeliness, transparency, and peer review, together with accuracy and clarity reviews (<http://www.nsf.gov>). Similar dimensions of data quality have been established by the International Association for Information and Data Quality: accuracy, validity, reasonability, completeness, and timeliness. Semantic differences aside, international standards set by professional organizations concerned with evaluation and data quality are converging toward consensus on what constitutes quality data. This consensus strengthens the construct validity of the EMIS benchmarking tool.

¹⁶ For a visual representation of this structure, see the Pôle Dakar website: http://www.poledakar.com/dqaf/index.php?title=File:DQAF_Framework_Hierarchy.jpg.

¹⁷ See <http://www.poledakar.com/dqaf> for a dedicated Wiki page containing a more detailed description of the methodology used and related documents.

¹⁸ See Patel, Hiraga, and Wang (2003) for an outline of the detailed Ed-DQAF framework.

technically or methodologically strong, if its findings are not used, it is not considered a good evaluation. UFE is used to enhance the likely utilization of evaluation findings and derive lessons learned from an evaluation process (Patton and Horton 2009). In order to enhance utilization, the UFE framework is based on a comprehensive yet simple checklist of the main steps that should be followed prior to conducting an evaluation, including identifying the main users of an evaluation's findings, the methods that should be used by the evaluation, and the analysis and dissemination of findings.

Although UFE is theoretically used to assess programs, its original framework has been adapted to assess how an EMIS is utilized. Instead of focusing on the complete EMIS structure, the UFE assesses the ways in which an EMIS is utilized by different education stakeholders. In order to follow this approach, the five key steps highlighted in the UFE checklist have been adapted to assess the utilization of an EMIS (figure 12). Using these five steps, an EMIS can identify EMIS users, assess their commitment and use of the EMIS system as a whole, evaluate their access to data and their skills in data analysis, and examine the dissemination strategies in place to distribute information generated by the EMIS. Most importantly, this approach assesses whether or not the information provided by the EMIS is actually utilized by education stakeholders.

Figure 12. Key Steps of UFE Adapted to Assess Utilization of an EMIS



Source: Adapted from Patton (2013).

As previously noted, specific elements of ISO 9000, Ed-DQAF, and UFE are amalgamated in the SABER-EMIS Tool—guided by the three principles of sustainability, accountability, and efficiency—to provide a systematic and practical way to benchmark an EMIS. Aspects of this tool have already been piloted, which validates its use for benchmarking. As such, the construct of the SABER-EMIS Tool aims to be comprehensive and applicable to all contexts.

SABER-EMIS Policy Areas

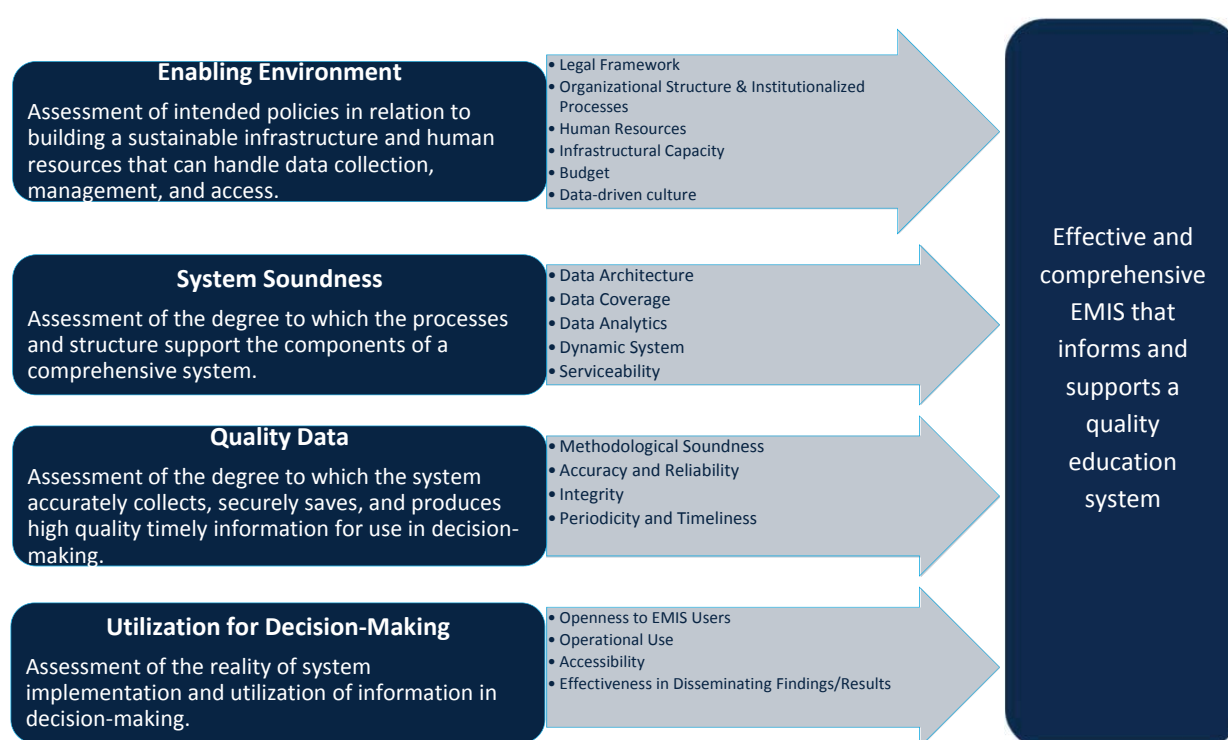
SABER studies an education system in its entirety, including its policy intent, policy implementation, and the policies and steps used to bridge intent and implementation. Given the data-related demands of an education system, it is similarly necessary to study an EMIS in its entirety by benchmarking and evaluating the policies related to it. This process helps identify where improvements are needed. Specifically, an EMIS is evaluated across the four cross-cutting policy areas introduced at the outset of this paper: the enabling environment; system soundness; quality data; and utilization for decision making (table 1). The discussion of the policy areas below focuses on the best-case scenario for an EMIS, that is, a comprehensive education information management system that collects quality data and is critical to policy decisions.

Table 1. Depth of EMIS Policy Assessment

Policy intent	Bridging policy areas	Policy implementation
Enabling context in which the system operates	Sound structure, processes, and quality data support the components of a comprehensive system	System is used to provide useful information to policy makers and other education stakeholders

For each policy area, a set of actions (or policy levers) for strengthening the EMIS are identified for decision makers. Figure 13 presents the SABER-EMIS analytical framework, including the four core EMIS policy areas and 19 associated policy levers.¹⁹

Figure 13. Policy Levers for Four EMIS Policy Areas



Policy area one: Enabling environment

For the purposes of this paper, the enabling environment is considered to be the legal framework; organizational structure; and institutionalized processes, human resources, infrastructural capacity, and budget of the system. This includes both the laws and the policies surrounding an EMIS. In essence, this policy area is the context in which an EMIS exists. This defined scope of an enabling environment builds on lessons learned from studies of education management systems. Since “EMIS development involves significant organizational, human resource, and technical challenges” (Cassidy 2006, 5), the enabling environment is a crucial policy area.

¹⁹ The policy areas and levers are in the process of being calibrated based on pilots.

Lever 1.1. Legal framework. It is imperative that an existing legal framework support a fully functioning EMIS. By definition, this legal framework has an enforcement mechanism. To avoid confusion regarding the system and ameliorate issues that arise from changes in government leadership, the needs of the system must be clearly outlined, using the following attributes:

Box 23. Enabling Environment: Lessons Learned

Lessons learned from EMISs in Uganda, Mali, and Zambia conclude that “creating a sustainable, workable EMIS depends on three factors:

1. The right PEOPLE, motivated to perform and skilled in their work;
2. The right PROCESSES that reduce duplication and reinforce accuracy and accountability; and
3. The right TECHNOLOGY, appropriate to the state of the country, and the reliability of its infrastructure.”

Source: Bernbaum and Moses (2011, 20).

- *Institutionalization of the system:* An EMIS is institutionalized as an integral part of the education system and, by extension, the government. The existence of the education system presupposes the need for an EMIS. The legal institutionalization of the EMIS codifies its activities.
- *Responsibility:* The responsibility for collecting, processing, and disseminating education statistics is clearly assigned to an institution or entity. This responsibility needs to be well defined and well communicated to other agencies.
- *Dynamic framework:* The legal framework is dynamic and elastic so that it can adapt to advancements in technology (Bodo 2011). This means that the framework is not driven by technology or a particular product and/or tool. The legal framework also needs to be broad enough so that it can be applied to different types of EMIS tools on an ad-hoc basis, such that ICT can be utilized to its fullest potential. The legal framework should also mandate that the EMIS undergo external and internal reviews.
- *Data supply:* The legal framework mandates that schools participate in the EMIS by providing educational data. This data will create the data supply for the EMIS and will be supplemented by data from the broader education community. The legal framework aims to hold schools accountable for supplying data and thus ensuring the sustainability of the EMIS, as well as for increasing school efficiency.
- *Comprehensive data and quality data:* The requirement of comprehensive, quality data is clearly specified in the legal framework for the EMIS. There is an established and known process for monitoring data collection, data processing, and data dissemination of education statistics. Data are comprehensive, meaning they portray a complete picture of the education system and are of high quality, as outlined in policy area three below.
- *Data sharing and coordination:* There is a legal framework allowing adequate data sharing and coordination between the Ministry of Education (or other ministries, depending upon where the EMIS is housed) and agencies and/or institutions that require the data (e.g., universities). The framework mandates that data be shared on a timely basis with other stakeholders.
- *Utilization:* The legal framework emphasizes data-driven decisions for education policy making.

- *Budget:* The education system budget includes a line item for the EMIS budget. The existence of a budget for the EMIS, as outlined in lever 1.5, is mandated by the legal framework.
- *Confidentiality:* The legal framework guarantees that respondents' private data are kept confidential and used for the sole purpose of statistics. The data are kept secure and protected from inappropriate access, as well as from unauthorized use and disclosure. This confidentiality is widely understood by EMIS clients and users. Additionally, the framework specifies that data collection, maintenance, and dissemination infrastructure be secure according to current multilevel security classifications. In addition, the framework is consistent with existing freedom of information laws: "The very existence of these laws has legal implications for education leaders and managers at all levels," since they can lead to greater access to education-related information (Cassidy 2006, 22).

Lever 1.2. Organizational structure and institutionalized processes. The institutional structure of the EMIS is well-defined within the government, has defined organizational processes, and has several functionalities beyond statistical reporting.²⁰ The unit has a mission statement, defined staff roles and responsibilities, a hierarchical structure, and a defined workflow. The specific organizational structure of the EMIS allows for institutionalized processes to occur. Defined processes are necessary for the effective flow of information so that all of the layers of the education system can have accurate and appropriate information about their respective roles and functions (Bernbaum and Moses 2011). The core tasks of the EMIS are also identified.

Lever 1.3. Human Resources. Qualified staff members operate the EMIS and opportunities are available to improve their performance and retention.

- *Personnel:* The core tasks of the EMIS are identified and the EMIS is staffed with qualified people who can build, maintain, and use the EMIS. An EMIS manager governs the system.
- *Professional development:* Professional development is a priority and training is available for staff working on the EMIS. Since computing power is relatively inexpensive, the issue of staff training and staff quality are pressing. The majority of the resources allocated for human resource development are spent on building capacity, including technical skills. There is a demand for EMIS staff with expertise in data analysts, evaluation, and education planning to strengthen their skills in these areas. Professional development is continuous and occurs regularly in order to keep up-to-date with changes in the system, user needs, and technologies. Additionally, there are efforts to retain staff by instituting a personnel evaluation system and clearly outlining career paths within the EMIS.

Lever 1.4. Infrastructural capacity.²¹ The EMIS has a well-defined infrastructure that enables it to perform its data collection, management, and dissemination functions in an integral manner. The infrastructure of the EMIS is generally context specific, but general elements of EMIS infrastructure need to be in place for the system to perform its designated functions. It goes without saying that the Internet has drastically impacted the ease of dissemination of education statistics and there have been advances

²⁰ According to Makwati, Audinos, and Lairez (2003), an EMIS generally has five functions: data collection (via censuses, surveys, management databases, and managerial documents), data processing (entering data into a structure), data presentation (generating tables, figures, and reports), data analysis, and data dissemination (using publications and websites).

²¹ Note that in some contexts, environmental factors (e.g., security, heat, and humidity) may prevent these tools from functioning.

in technology to support EMIS operations. Because of these advances, there are more choices available to users (Cassidy 2006). Additionally, other open-source instruments are available for use with handheld devices that can enhance the EMIS.²² As the following quote shows, there is increasing use of ICT in EMIS operations: “Results from surveys undertaken by the Association for the Development of Education in Africa (ADEA) Working Group on Education Management and Policy Support (WGEMPS) on the status of EMIS in most Sub-Saharan African countries indicate some progress towards the use of ICT in EMIS operations—e.g., the use of desktop computers and servers, email and Internet, as well as availing EMIS data and information on the Ministry websites” (Bodo 2011).

Lack of infrastructure can limit a system’s sustainability and efficiency. As such, sometimes the infrastructure is outdated and there is a need for the “development of strategies to overcome constraints of outdated organization[al] structures, processes, and practices” (Cassidy 2006, 16). This requires an evaluation of the infrastructural tools that support EMIS functions, together with other necessary infrastructure.

- *Data collection:* Tools for data collection are available. Data collection from the school occurs via censuses, management databases, and managerial documents. Tools for data collection include such technological means as Web-based applications, tablets, and mobile technologies, and such nontechnological means as paper.
- *Database(s):* EMIS databases exist under the umbrella of the data warehouse and use hardware and software means for data collection, management, and dissemination. Databases are housed on data servers (e.g., in a data warehouse) that are archived to ensure redundancy.
- *Data management system:* A system within the EMIS manages the collected data, processes it, and produces reports. The data management system takes completed databases and converts them into business intelligence via information systems (e.g., applications such as Banner, PeopleSoft, Oracle, Concordance) that perform processing, presentation, and analysis. The data management system exists as a layer on the data servers. Data management occurs via a combination of software and hardware, including computer systems, data warehouses, database technologies, email systems, software for statistical analysis and data management, and disc space for capacity-building training materials. Computing technology is used to increase the efficiency of resource use; these resources need to be commensurate with statistical programs of the education data agency. Software is continually updated and well adapted to perform existing and emerging tasks and there is sufficient hardware to ensure both efficient processing of data and database management.
- *Means of data dissemination:* Data dissemination tools are available and maintained by the agency producing education statistics. There are policies to support the dissemination of data via the Internet, mass media, annual educational statistical yearbooks and/or handbooks, and electronic databases (e.g., dashboards), which are maintained by the agency producing education statistics.

²² Applications for mobile devices in developing countries have been developed for use in other sectors, but are being applied to education management information systems.

Lever 1.5. Budget. The EMIS budget is comprehensive in order to ensure continuity of operations, system sustainability, and efficiency.

- *Personnel and professional development:* The EMIS budget contains a specific budget for necessary personnel recruitment and professional staff development. Human resources are costlier than the technologies necessary for an EMIS infrastructure, as the “high recurrent cost of EMIS staffing and maintenance tend to be overlooked or under-estimated” (Crouch, Enache, and Supanc 2001, 48).
- *Maintenance:* The EMIS budget includes budgeting for the maintenance and recurrent costs of the system, such as IT license renewal fees.
- *Reporting:* The EMIS budget contains specific financing for reporting costs, including the publication of reports (i.e., their printing and copying) and the creation and maintenance of websites and online accessible databases.
- *Physical infrastructure:* The budget contains a specific budget for four components of EMIS infrastructure: hardware (e.g., computers, networking, data collection devices), software (e.g., tools for data collection, analysis software, reporting software), technical support (e.g., maintenance of databases, hardware, and software), and space (including infrastructure rental, if applicable).
- *Efficient use of resources:* Processes and procedures are in place to ensure that resources are used efficiently. This element is critical because it provides a quick diagnostic of the agency. Audits are performed to eliminate waste within the system and the budget is reallocated as necessary when funds are used inefficiently.

Lever 1.6. Data-driven Culture. A data-driven culture prioritizes data as a fundamental element of operations and decision making, both inside and outside of the education system. Evidence of a data-driven culture can include efforts by the government to promote the collection and utilization of data within and beyond the education system (e.g., national census, funding to research institutes that use data, population statistics, etc.). Additionally, the presence of nongovernmental organizations that promote effective use of data, such as the Data Quality Campaign (box 9), could signify a data-driven culture.

Policy area two: System soundness

The processes and structures of the EMIS are sound and support the components of an integrated system. Education data are sourced from different institutions, but all data feed into and comprise the EMIS (figure 5 above). Databases within an EMIS are not viewed as separate databases, but as part of the EMIS.

Lever 2.1. Data architecture. The data architecture of the EMIS is well defined to ensure full system functionality. The database is structured according to relational standards, well documented, and secure according to current security architecture standards. The database architecture is the set of specifications and processes that prescribe how data is stored in and accessed from a database (Lewis et al. 2001). This series of streamlined processes encompasses the functionalities and technologies of an EMIS and contains a wireframe (“blueprint” of the architecture) that highlights the sequences and connected relationships among the different indicators in the data. The wireframe also includes a table of specifications that identifies all elements contained in the data architecture. Additionally, application

programming interfaces (APIs) specify how software components within the EMIS interact. Lastly, the system is able to ensure data security and confidentiality through the use of data classification levels, a multilevel security system, and the capacity to encrypt data.

Lever 2.2. Data coverage. The data in the EMIS is comprehensive, contains some private data, and covers major types of education data, including administrative, financial, human resources, and learning outcomes. Table 2 shows the categories of data that should be contained in an EMIS, although the type of data in each category is not exhaustive.

Table 2. Data Coverage

Administrative data	Financial data	Human resources data	Learning outcomes data
<ul style="list-style-type: none"> ➤ Enrollment rates, including access and drop-out rates ➤ Ratios, including student to teacher, school to student ➤ Other rates, including completion, progression, and survival rates ➤ Behavioral data, including absenteeism and late arrivals for both teachers and students ➤ Special-needs population data ➤ Administrative indicators such as efficiency, school development plans, teacher qualifications (e.g., age, agenda, etc.) ➤ Financial assistance data such as school-feeding programs (and Title I in the United States) ➤ School improvement program data ➤ Service delivery indicators 	<ul style="list-style-type: none"> ➤ Budget expenditure ➤ School fees ➤ Supply-side items such as textbooks, teaching materials, desks, paper, and writing instruments 	<ul style="list-style-type: none"> ➤ Salaries for teaching and non-teaching staff, including administrative, management, security, janitorial, and transportation staff ➤ Information about who is working at the school and who assists in transporting students to school ➤ Conditional cash transfer data ➤ Professional development data ➤ Number of years of experience for teachers ➤ Development courses, training, certifications, and allowances for teaching and non-teaching staff ➤ Ministry of Finance data regarding human resources (if applicable) 	<ul style="list-style-type: none"> ➤ Grades ➤ National assessments ➤ Classroom assessments

Lever 2.3. Data analytics. Tools and processes are available to perform data analytics at different levels on a regular basis. Data analytics is a business intelligence process and ultimately leads to a decision-support system that helps planning and targeting policies. Processes to perform data analytics include descriptive and exploratory data analytics, data tabulations, data associations, correlations, predictive models, and scenario analysis. Tools to perform these analytics include statistical tools such as SPSS, STATA, or open-source statistical analysis tools such as “R.” The outputs of these analytics can range from basic tables and graphs to more complex reports.

Lever 2.4. Dynamic system. The EMIS is elastic and easily adaptable to allow for changes and/or advancements in data needs. It is an agile system that can be adapted to provide solutions to emerging needs.²³

- *Maintains quality assurance measures:* The system is dynamic and maintains quality assurance measures. Systems should follow and implement an internationally accepted quality assurance management approach (e.g., ISO 9000, Total Quality Management). In order to maintain quality, internal and external reviews are performed. Processes are in place that focus on data quality, collection monitoring, processing and dissemination of education statistics, and inclusion of data quality in statistical planning.
- *Data requirements and considerations:* There are mechanisms for addressing new and emerging data requirements. Processes are in place to deal with quality considerations in planning EMIS processes. EMIS stakeholder and other data users periodically review the existing portfolio of education statistics and attendant statistical reports and identify any emerging data requirements. Data in the system can be aggregated or disaggregated without difficulty. The system is able to adapt to new or emerging data requirements.
- *System adaptability to changes and/or advancements in the education system:* The system is adaptable to changes and/or advancements in the education system, including advances in technology. These changes and/or advancements include new arrangements in schools, added functionalities (e.g., new reported data for a specific school), and new technologies. If the method of collecting data changes due to a new technology, the data can still be housed within the existing system. For example, if a new category of students needs to be included in the data warehouse, this can be easily created and integrated within the existing system. The system is also able to work with pre-existing components (e.g., legacy systems), as needed.

Lever 2.5. Serviceability. The EMIS is at the service of clients by ensuring the relevance, consistency, usefulness, and timeliness of its statistics. Educational statistics within the system have to be relevant for policy making and should allow other stakeholders (including parents and civil society) to obtain objective information about sector performance in a user-friendly manner.

- *Validity across data sources:* Information that is brought together from different data and/or statistical sources in the EMIS data supply is placed within the data warehouse, using structural and consistency measures. Data collection instruments are carefully designed to avoid duplication of information and lengthy data compilation processes. Key variables are reconciled across databases. The procedures for data compilation are managed to minimize processing errors. The total statistics reported are the sum of the components of the total. Final statistics are consistent across a dataset and over time, and between all databases and datasets. Historical series are reconstructed as far back as reasonably possible when changes in source data, metadata, methodology, and statistical techniques are introduced. The emphasis on consistency is focused on final versus preliminary statistics. Lastly, pre-existing data collection and management systems are compatible with similar EMIS functions.

²³ An agile system is one that is dynamic, has non-linear characteristics, and is adaptive in its development methods. In sum, an agile system is one that innately responds well to change.

- *Integration of non-education databases into EMIS:* Data collected by other agencies outside of the EMIS (e.g. administrative data, population data, socio-demographic data, and sometimes, geographic information systems data) are integrated into the EMIS data warehouse; APIs are important for this integration. Manual operations (e.g., data collected via non-technological means) need to be integrated as well. Conversely, EMIS data may be integrated into databases and tools maintained by other agencies or institutions; however, this integration is not necessarily crucial to the functioning of an EMIS.
- *Archiving data:* Multiple years of data are archived, including source data, metadata, and statistical results. Databases are archived on computer servers.
- *Services provided to EMIS clients:* Services provided to EMIS clients include ensuring the relevance, consistency, usefulness, and timeliness of its statistics.

Policy area three: Quality data

The processes for collecting, saving, producing, and utilizing information ensures accuracy; security; and high-quality, timely, and reliable information for use in decision making. Data quality is a multidimensional concept that encompasses more than just the underlying accuracy of the statistics produced. It means that not only is the data accurate, but that the data addresses specific needs in a timely fashion. The multidimensionality of quality makes achieving quality education more challenging, as it goes beyond quantitative measures. This difficulty is compounded by the inadequacy of education statistics in many education systems. Therefore, it is necessary to evaluate and benchmark the quality of data within an EMIS.

Lever 3.1. Methodological soundness.

The methodological basis for producing educational statistics from raw data should follow internationally accepted standards, guidelines, and good practices. This means the generation and use of well-structured metadata. Methodological soundness may be evaluated on the basis of a hybrid of internationally and nationally accepted standards, guidelines, and good practices, including but not limited to UIS technical guidelines and manuals and the OECD Glossary of Statistical Terms.²⁴

- *Concepts and definitions:* Data fields, records, concepts, indicators, and metadata are defined and documented in official operations manuals (e.g., national statistics indicators handbook); in accordance with other national datasets; and endorsed by official entities in government. These concepts and definitions are easily accessible. The overall concept and definitions follow regionally and internationally accepted standards, guidelines, and good practices. Data compilers are aware of the differences between concepts and definitions used in the source data and those required of education statistics.
- *Classification:* There are defined education system classifications such as level of education and type of school (e.g., public or private school), between full- and part-time students (if applicable), and between teaching and nonteaching, or trained and untrained, staff based on technical guidelines and manuals. The classification of educational expenditures is based on UIS technical guidelines, as well as the United Nations System of National Accounts. These classification systems are in accordance and broadly consistent with internationally

²⁴ To access these two resources, see the UIS website at <http://glossary.uis.unesco.org/glossary/map/terms/176>, and the OECD website at <http://stats.oecd.org/glossary/detail.asp?ID=6152> (accessed July 30, 2014).

accepted standards, guidelines, and good practices. This includes national classification programs and their application in public and private institutions, UIS-ISCED (International Standard Classification of Education) mapping, and reporting data according to recent ISCED codes.

- *Scope:* The scope of EMIS data is broader than and not limited to a small number of indicators, such as measurements of enrollment, class size, and completion. The scope of education statistics is consistent with international standards, guidelines, and good practices. The dataset identifies data overlaps in order to avoid redundancies and metadata is considered in the scope of education statistics.
- *Basis for recording:* Data recording systems follow internationally accepted standards, guidelines, and good practices. The age of students is recorded according to a specific reference period and/or date. Graduate data is recorded according to the academic year in which graduates were first enrolled. Data on actual expenditures are recorded per unit cost.

Lever 3.2. Accuracy and reliability. **Source data and statistical techniques are sound and reliable and statistical outputs sufficiently portray reality.** This section examines the accuracy and reliability of source data (from schools and other sources, such as government demographic research units). The term “source data” refers to data provided by schools and other government agencies and/or institutions to the agency responsible for education statistics. Most data processed by this agency are source data, since they are generated by schools and education-related administrative units.

- *Source data:* Available source data provide an adequate basis for compiling statistics. Source data are collected by means of an administrative school census (or the aggregate of local government data) that gathers actual information about all students, all teachers, all schools, and all education expenditures. Other data sources include government agencies that track population, poverty, and early childhood education data. Data collection instruments allow for ease of completion and are compatible for computer processing. The school registry covers all public and private schools and is used to identify which schools provide administrative data and which do not.

Source data obtained from comprehensive data collection programs take into account country-specific conditions. To the extent possible, education statistics describe the structure and normative characteristics of the education system, consistent with current ISCED standards. Data produced from the EMIS are compatible with official nationally and internationally reported data. The data collection system collects, processes, and reports source data and detailed data in a timely manner consistent with the needs of the education system.

- *Validation of source data:* Source data are consistent with the definition, scope, classification, time of recording, reference periods, and valuation of education statistics. Source data—including censuses and administrative records—are regularly assessed and validated in terms of accuracy. Well-defined measures are standardized and systematically implemented to validate data sources. Use of school registries is promoted and accuracy is periodically assessed. Statistical discrepancies and other potential indicators of problems in statistical outputs are investigated.

- *Statistical techniques:* Statistical procedures (e.g., imputation methods, estimation techniques) are used to calculate accurate rates and derived indicators. Projections (including population projections) are computed according to sound methodological procedures. The nature of missing data is described, as appropriate, and problems in data collection are addressed. Adjustments are made if sizable parts of a population are not covered by the data sources used for regular statistical compilation. Revisions to methodology are reviewed regularly.

Lever 3.3. Integrity. The information contained within the EMIS is guided by principles of integrity. The issue of integrity in educational data and statistics is important for the internal well-being of the education statistics agency. It also has a strong political impact because the belief in data integrity is crucial for maintaining the trust of the general public and achieving political accountability in education. If the public perceives that education data is compromised by politics and therefore not credible, support for education reform or for public education in general is likely to be thin. In addition, regaining the public trust may take many years, making it difficult for the agency in charge of education statistics to get the resources it needs to do its job properly.

Integrity in educational data refers to the extent to which educational statistics and their reports reflect the values, beliefs, and principles that the government claims to uphold:

- *Professionalism:* EMIS staff exercise their profession with *technical independence and without outside interference* that could violate public trust in EMIS statistics and the institution of the EMIS itself (World Bank 2013a). The term professionalism refers to the ability of statistical staff to exercise their technical expertise, make independent judgments, and follow a professional code of conduct. Professionalism is promoted by the publication of methodological papers and participation in conferences and meetings with other professional groups.

The system is led by strong technical professionals who exercise professional judgment with neutrality. Reports and analysis undertaken by the EMIS for publication are subject to internal review and other processes to maintain the agency's reputation for professionalism. Professional competence plays a key role in recruitment and promotional practices for core areas of the EMIS. Lastly, professionalism is necessary to maintain confidentiality, as outlined in the legal framework. EMIS staff are limited to working with the data required to perform their jobs; penalties are in place for staff that misuse this data or wrongly disclose confidential information.

- *Transparency:* Statistical policies and practices are transparent. The terms and conditions under which statistics are collected, processed, and disseminated are available to the public. Products of statistical agencies and/or units are clearly identified. Prior to their public release, statistics are often first made available internally to government institutions (following a review process and schedule). Such internal processes are acceptable as long as data integrity is not compromised. The public must be aware of this practice. Additionally, major changes in methodology, source data, and statistical techniques are communicated and publicized.
- *Ethical standards:* Policies and practices in education statistics are guided by ethical standards. EMIS managers conduct a review of potential conflicts of interest and the appropriate steps and measures to be taken in the event of their occurrence. The adoption

of ethical standards by the agency in charge of education statistics implies that the agency follows clear standards of good conduct and that those standards are well defined and clear to both its staff and the general public.

Lever 3.4. Periodicity and timeliness. EMIS data and statistics are produced periodically and in a timely manner.

- *Periodicity:* The production of reports and other outputs from the data warehouse occur in accordance with cycles in the education system that concern such decisions as accreditation, staffing, curriculum, and grade advancement. The administrative school census is conducted at least once per year and financial education statistics (inclusive of expenditures, earnings, etc.) are published annually via a financial statement. Learning achievement surveys are regularly conducted according to country monitoring needs.
- *Timeliness:* Final statistics, including financial statistics, are disseminated in a timely manner. Final statistics are derived from the administrative school census and disseminated within 6 to 12 months after the beginning of the school year. Financial statistics are disseminated within 6 to 12 months of the end of the financial year.

Policy area four: Utilization for decision making

The EMIS is wholly utilized by different users of the system to make decisions at different levels of the education system. An EMIS needs to be used so that measures can be taken to improve educational quality. Accurate information on education sector performance enables the design of more informed policies and programs. It is imperative to understand where decision making occurs, if the capacity to analyze and interpret education data exists, and if specific data is available to inform decisions. “Lack of knowledge and skills to use data and information is not so much limiting the EMIS development as it is limiting development of the education system” (Cassidy 2006, 19). Therefore it is important to understand how an EMIS is utilized. (See annex A for an overview of the broad scope of users who are involved in an EMIS).

Lever 4.1. Openness. The EMIS is open to education stakeholders in terms of their awareness and capacity to utilize the system. An EMIS is primarily utilized by policy makers and school clients; however, other education stakeholders greatly benefit from and determine a wide variety of uses for the information produced by an EMIS. This lever demonstrates the volume and breadth of use of an EMIS by its users.

- *EMIS stakeholders:* EMIS stakeholders are identified and use the system in accordance with the legal framework. These stakeholders include the Ministry of Education (or other education statistics-producing ministries), school managers, educators, students, parents, educational NGOs, researchers, and multilateral agencies. Different stakeholders may have different needs that are addressed by an EMIS.
- *User awareness:* Current and potential EMIS users are aware of the EMIS and its outputs. There has been a shift in EMIS from “data control” to “data share” due to the increased accessibility of data in all forms, which actually increases awareness (Hua 2011). Great awareness of an EMIS leads more stakeholders to utilize the system. A study that examined users’ awareness of an EMIS in Ghana found that EMIS users were those who were aware of its existence. In Ghana’s case, the distribution of educational resources has been skewed in favor of those groups aware of the existence of the EMIS: “If EMIS has the potential of giving

information on the state of resources... but is not known, the tendency of resource allocation may be skewed in favor of some section of society who will take advantage and use it because they knew about it” (Aheto and Fletcher 2012, 22).

- *User capacity:* EMIS users should have the skills to interpret, manipulate, and utilize the data (especially quantitative information) produced by the system in order to ultimately disseminate findings. However, stakeholders do not always have this capacity. Building the capacity of stakeholders to use statistics produced by an EMIS is crucial for better accountability and the support of decision making.²⁵ EMIS users should also be able to produce materials related to their analysis (e.g., graphs, charts, etc.). Regular trainings, dissemination of materials, and stakeholder sessions should be available to current EMIS users on how to perform these activities and utilize EMIS statistics to inform decision making at all levels of the education system.

Lever 4.2. Operational use. Data produced by the EMIS are used in practice by the main education stakeholders. An EMIS should theoretically be the “primary source of operational management data” for the education system (Spratt et al. 2011, ES–3). This lever evaluates the contexts in which EMIS data is used in practice.

- *Utilization for evaluation:* Data produced by an EMIS is used to assess the education system. Evaluation is an essential process to build and maintain a quality education system. An effective EMIS provides statistics that serve as a prerequisite for evaluating an education system.
- *Utilization for governance:* Data produced by the EMIS is used by the government to make evidence-based decisions. Education statistics provided by the EMIS are essential for national governments since they monitor and track relevant education information that informs sector planning, programs, and policy design (Makwati, Audinos, and Lairez 2003). Policy making requires data from multiple sources, multiple levels of the education system, and multiple points in time. Consulting accurate and reliable education statistics helps improve accountability since policy makers tend to rely less on politics and opinion. EMIS data support education policy decisions by highlighting the strengths and weaknesses of the education system.
- *Utilization by schools:* Data produced by the EMIS are used by schools. As noted, a trend toward decentralized education systems is seeing management and governance functions devolve to schools and their clients. A decentralized structure facilitates an EMIS that is better equipped to understand the needs of users and in turn, makes for better decision making and planning. In order to play their role, schools and their clients use an EMIS to obtain statistics on the academic and financial performance of their school relative to other schools. Moreover, by having access to an EMIS, schools are able to better allocate resources and plan for the specific needs of each school (Bernbaum and Moses 2011).
- *Utilization by clients:* Data produced by an EMIS is used by clients, including parents, communities, and other actors. By having access to this information, clients of the education system have knowledge about school performance (e.g., school rankings, teacher

²⁵ For example, Ghanaian school councils have received training on how to conduct a self-assessment and how to interpret data. Training on an EMIS should be given to all main stakeholders in an education system to ensure more exhaustive use of the EMIS for managing the education system, including planning, and policy making (Aheto and Fletcher 2012).

absenteeism, etc.), which enables them to select schools and demand improvements from both schools and national education authorities. Clients are empowered to make these demands based on the availability of quality information. Lastly, other actors can include the private sector, for example, vendors and software and/or application developers that specifically utilize data produced by an EMIS in order to improve their products, tools, and applications.

Lever 4.3. Accessibility. Education statistics are understandable and disseminated widely to education stakeholders via a clear platform for utilization, complemented by user support (World Bank 2013d). This section examines how education statistics are presented, seeking a system where statistics are shown in a clear and understandable manner, where forms of dissemination are adequate, and statistics are made available on an impartial basis.

- *Understandable data:* Data are presented in a manner that is easily digestible. Statistics are presented in a clear and understandable manner and forms of dissemination are adequate for users. The public is aware of the data products that are disseminated. The use of electronic databases is validated by data-producing units. Statistics are presented in a way that facilitates proper interpretation and meaningful comparisons (i.e., layout and clarity of text, tables, and charts).
- *Wide dissemination:* Education statistics are disseminated beyond the Ministry of Education and/or the education statistics-producing agency to other EMIS stakeholders. Up-to-date and pertinent metadata are also made available to users. Statistics are released on a pre-announced schedule and those that are not routinely disseminated are made available upon request. Data dissemination tools are available and maintained by the agency producing the statistics. Dissemination occurs via the Internet, mass media, annual educational statistical yearbooks and/or handbooks, and electronic databases (e.g., dashboards) maintained by the agency producing education statistics. Dissemination uses media and formats that are compatible with existing systems, with data categories and fields adapted to the needs of intended audiences. Results from data analytics are downloadable from the data warehouse.
- *Platforms for utilization:* Standardized platforms exist across the EMIS, but are customizable to user needs. An EMIS needs to reach local-level users by providing information that serves parents and schools (as its principal clients), in addition to education ministry planners.²⁶ At a minimum, an EMIS requires a standardized dashboard-type system that EMIS users can utilize to view relevant data. This strategy allows EMIS users to see the complete picture of the data and has the capacity to inform decision making specific to the user. (Users are able to see the complete picture of the data on their own without the assistance of the education statistics agency.) If user needs are not met by utilizing this pre-constructed tool, users are able to produce their own tools to analyze and interpret data produced by the EMIS. In the latter case, users produce materials related to their analysis (e.g., graphs, charts, etc.).
- *User support:* Assistance is provided to users upon request to help them access EMIS data. Clear instructions on how to find information in the EMIS are available to stakeholders.

²⁶ For example, in Nigeria a dialogue between parents, teachers, and principals was critical to the redesign of the data collection tool and the EMIS so that they were adapted to the technological restraints of these stakeholders (Bernbaum and Moses 2011).

Prompt and knowledgeable support service is also available. The schedule for data requests are known to EMIS users. Procedures concerning requests are clearly defined and assistance to users is monitored, with additional queries also monitored.

Lever 4.4. Effectiveness in disseminating findings/results. The dissemination of education statistics via a management information system is strategic and effective.

- *Dissemination strategy:* National governments have an information dissemination strategy in place. This strategy increases user awareness of the analysis and interpretation of EMIS data and consequently, the utilization of the EMIS by more stakeholders. “A supply of better data is not enough to insure meaningful data use” (Cassidy 2006, 11). This strategy includes the dissemination of materials (e.g., leaflets, bulletins, newsletters, downloadable Internet documents, etc.) to inform the public of EMIS operations and objectives.
- *Dissemination effectiveness:* The dissemination of EMIS education statistics is effective. Stakeholders must be able to communicate the data findings produced by an EMIS. The effectiveness of dissemination efforts can be measured by whether EMIS users have provided feedback with regard to the data and whether or not this feedback is utilized.

Piloting the Concept of EMIS Benchmarking

The concept of EMIS benchmarking was piloted with respect to the data quality policy area. For this purpose, a simplified tool was piloted based on the Ed-DQAF, including different data quality components and a scoring system.²⁷ Within the data quality policy area, the tool benchmarked a variation of the four policy levers. While this tool allowed for data quality to be evaluated within the SABER EMIS framework, more importantly, it demonstrated the feasibility of the concept of evaluating an EMIS. Previous efforts to benchmark an EMIS confirm the applicability of the work presented in this framework paper. It is important to consider these efforts to ensure that the new tool is developed with an integrated approach. The benchmarking tool set forth in this framework paper builds on this prior tool and will create a more comprehensive framework for data collection and scoring.

The pilot of a simplified tool demonstrated the usefulness of EMIS benchmarking. In 2011, EMIS was a focal area in a proposed three-state education investment project in Nigeria. A tool was used to identify the weakest dimensions of data quality in the EMIS for the three Nigerian states of Anambra, Bauchi, and Ekiti. The tool revealed that all three states had low scores in three dimensions: methodological soundness, accessibility, and serviceability. These findings were used to lay out an action plan to improve data quality in each state (World Bank 2013b). In another benchmarking study, the pilot tool assessed the EMIS of six states of the Organization of Eastern Caribbean States (OECS): Antigua and Barbuda, The Commonwealth of Dominica, Grenada, St. Kitts and Nevis, St. Lucia and St. Vincent, and the Grenadines.²⁸ The aim of the assessment was “to assist these OECS countries in the improvement of their education statistics from data collection to compilation, analysis, and reporting. The goal of this effort is to improve education quality by generating better information about education sector performance” (Porta et al. 2012, 4).²⁹ Similarly, the second pilot highlighted the tool’s usefulness and validity for identifying gaps in specific EMIS dimensions.

²⁷ The SABER EMIS Assessment Tool (SEAT) used in the pilot study can be downloaded from the following link: http://wbfiles.worldbank.org/documents/hdn/ed/saber/supporting_doc/Background/EMS/SABEREMIS.pdf (accessed July 30, 2014).

²⁸ The Education Reform Unit of OECS and the World Bank conducted this study in Castries, St. Lucia, from January 23 to January 28, 2011.

²⁹ This source describes the results of the application of the SEAT.

Chapter III: Situation Analysis of an EMIS

Benchmarking an EMIS within a country will result in an improved understanding of the existing system and provide a foundation for system-wide improvements. Benchmarking will also allow policy makers to conduct scenario analysis and identify how policy changes can impact scores and hence improve an EMIS. Following such an exercise, the final analytical step is to perform an in-depth situation analysis via SWOT (strengths, weaknesses, opportunities, threats). This analysis allows evaluators to identify policy changes that could improve the EMIS.

SWOT Approach

SWOT is a situation analysis tool used for the identification and evaluation of strengths, weaknesses, opportunities, and threats (figure 14).³⁰ The simplicity of the tool allows it to be applied to complex contexts. The tool is especially appropriate because it can be used in the early stages of strategic decision making; the findings of this tool will thus inform future policy-related decisions (Humphrey 2005).

The following model illustrates the theoretical framework used to evaluate an EMIS. All four policy areas are benchmarked using a detailed questionnaire, then scored using a four-level scale (latent, emerging, established, and advanced). In theory, benchmarking results for the enabling environment, quality data, and utilization for decision making indicate the soundness of a system. System soundness is thus evaluated on the basis of these three policy areas. In effect, a situation analysis is performed to evaluate the entire system (figure 15).

Concluding an EMIS Benchmarking Exercise

Benchmarking the four policy areas of an EMIS is important, but countries and policy makers are also interested in understanding the strengths and weaknesses of the system. After benchmarking the four policy areas using the SABER EMIS rubric (see annex B for complete rubric) and questionnaire, a second level of analysis is performed using SWOT. The four policy areas are projected onto the SWOT through the rubric's 19 policy actions (i.e., policy levers). Each level of the benchmarking scale is then quantified (latent = 1, emerging = 2, established = 3, and advanced = 4) (figure 16). This is necessary in order to assess the overall system (note that strengths and opportunities are combined, as are weaknesses and threats).

This dual-layer is a stronger way to implement a SWOT analysis. Performing a situation analysis via SWOT enables an evaluator to translate 10 ratings on policy components into actions. This is another level of factoring and/or clustering scores into weaknesses and strengths to provide an assessment summary. The analysis may conclude, for example, that the data clusters in a way that differs from the policy areas. Policy recommendations are then based on the results of the SWOT analysis. By analyzing benchmarked findings, this approach makes SABER operational.

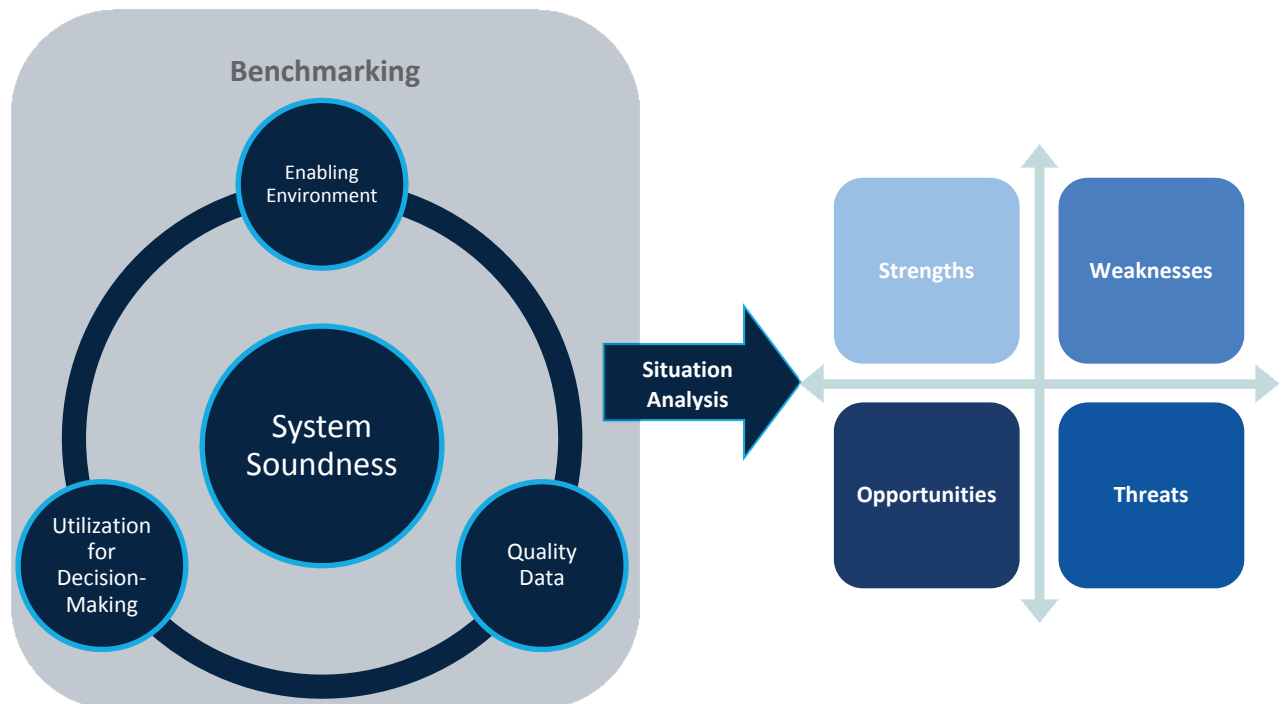
Figure 14. SWOT Analysis Tool



Source: Humphrey (2005).

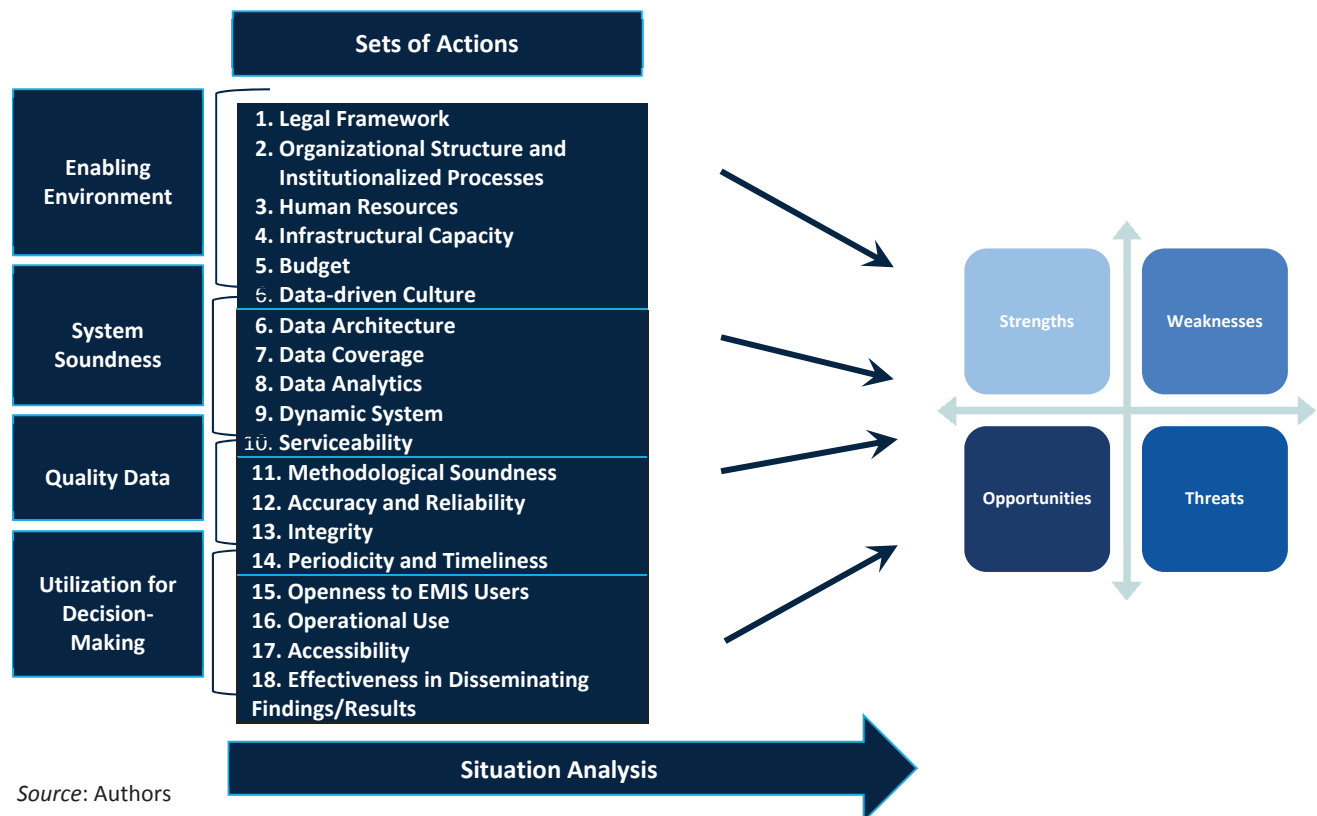
³⁰ The development of SWOT is credited to Albert Humphrey and his team at the Stanford Research Institute based on research between 1960 and 1970 (Humphrey 2005).

Figure 15. Theoretical Framework for Benchmarking an EMIS



Source: Authors

Figure 16. Analysis of EMIS Benchmarking Results



Source: Authors

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Annex A: EMIS Users

Table 3. Potential EMIS Stakeholders and their Associated Uses of an EMIS

Potential stakeholder	Principal uses of EMIS
Ministry of Education (or the education statistics-producing agency)	Planning, budgeting, monitoring, and evaluation of educational indicators; allocation of resources (infrastructure, personnel, logistics); policy formulation and implementation; general management of the educational sector; others (use of EMIS databases to generate reports, etc.)
Directors of regional/metropolitan/municipal/district education offices	Planning, budgeting, monitoring, and evaluation of educational indicators; allocation of resources (infrastructure, personnel, logistics); policy formulation and implementation (infrastructure, personnel, logistics); use of EMIS as a database/inventory (for resources, personnel, students); efficient management, including training and remediation; other (e.g., generating reports, conducting annual reviews, etc.)
National Education Service Office (deputy directors and scheduled officers)	Planning, budgeting, monitoring, and evaluation of educational indicators; allocation of resources (infrastructure, personnel, logistics); disbursement of capitation grants; policy implementation and interpretation; efficient and strategic school management, including training and remediation; other (e.g., tracking baseline exams)
Metropolitan/municipal/district assemblies	Planning, budgeting, monitoring, and evaluation of educational indicators; allocation of resources; as a resource inventory (of infrastructure, capitation grants, logistics); policy formulation, implementation, and projections; other (e.g., political interventions, checking status of drop-out rate, etc.)
Teachers	Checking available vacancies for possible transfers; monitoring and evaluating school performance; policy implementation; as an educational database
Parents	School selection (senior high school) for their wards; as a status report on schools (facilities and performance); as a basis for supporting schools and learners (e.g., infrastructure development)
Schools (headmasters/headmistress, head teachers)	For planning, budgeting, monitoring, and evaluation of educational indicators for an individual school; allocation of resources (infrastructure, personnel, logistics); producing status reports on school performance; as a database/inventory (for resources, personnel, students); efficient management, including training and remediation; assessment of strengths and weaknesses of individual schools
Circuit supervisors	For planning, budgeting, monitoring, and evaluation of educational indicators for schools; allocation of resources (infrastructure, personnel, logistics); as a status report for Circuit Supervisors in their circuits; as a database/inventory (for resources, personnel, students); managing and mapping strategies for effective supervision and visits
Nongovernmental organizations (NGOs)	Offering assistance/support where necessary (e.g., infrastructure); offering free training, teaching, and learning materials and awards to deserving students and education sector workers; conducting enrollment and expansion drives for communities experiencing high drop-out rates; soliciting support for capacity building; advocating for improvement in educational standards when current standards are failing
Civil society organizations, teacher associations, parent associations	Advocacy efforts; supporting community decision making; professional development; decision making regarding school selection; academic purposes

Researchers	Monitoring and evaluating educational indicators; giving suggestions and recommendations regarding educational research findings; academic purposes; forecasting
Multilateral development organizations (e.g., World Bank, UNESCO) and bilateral agencies (e.g., donor agencies)	Planning, budgeting, monitoring, and evaluation of educational indicators; research to identify those areas in need of assistance and improvement; assisting the educational sector through training, resourcing, and provision of infrastructure; benchmarking against other nations and international standards; as basis for securing funds for educational improvement
Students	Monitoring and evaluating their performance

Source: Aheto and Fletcher (2012)

Annex B: SABER-EMIS Rubric

Table 4. SABER-EMIS Rubric with Associated Best Practices and Scoring Categories

Policy Levers	Indicators	Description of Best Practices	Scoring			
			Latent	Emerging	Established	Advanced
1.1	Legal Framework	<p>POLICY AREA 1: ENABLING ENVIRONMENT</p> <p>The system contains crucial components of a comprehensive enabling environment, which addresses related policy elements and enables the functioning of an effective and dynamic system</p> <p>There is an existing legal framework to support a fully-functioning EMIS</p>	The system lacks major components of a comprehensive enabling environment	The system contains basic components of a comprehensive enabling environment	The system contains most components of a comprehensive enabling environment	The system contains crucial components of a comprehensive enabling environment
			There is not a legal framework in place	Basic components of a legal framework or informal mechanisms are in place	Most elements of a legal framework are in place	There is an existing legal framework to support a fully-functioning EMIS
				Institutionalization of system: EMIS is institutionalized as an integral part of the education system and the government	Responsibility: responsibility for collecting, processing, and disseminating education statistics is given to a clearly designated institution or agency	Dynamic framework: the legal framework is dynamic and elastic so that it can adapt to advancements in technology

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	<p>Data supply: the legal framework mandates that schools participate in the EMIS by providing education data</p> <p>Comprehensive, quality data: the requirement for comprehensive, quality data is clearly specified in the EMIS legal framework</p>					
	<p>Data sharing and coordination: the legal framework allows for adequate data sharing and coordination between the Ministry of Education and agencies and/or institutions that require education data</p> <p>Utilization: the legal framework emphasizes data-driven education policy</p> <p>Budget: the education system budget includes a line item for the EMIS</p> <p>Confidentiality: the legal framework guarantees that respondents' data are confidential and used for the sole purpose of statistics</p>					
1.2	Organizational structure and institutionalized processes	Organizational structure and institutionalized processes	The system is not specified in policies and what exists does not have well-defined organizational processes; EMIS has limited functionalities	The institutional structure of the system is not clearly specified in policies, it has some organizational processes and its functionalities are limited	The institutional structure of the system is defined within the government, it has defined organizational processes, but its functionalities are limited	The system is institutionalized within the government, has well-defined organizational processes, and has several functionalities beyond statistical reporting

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1.3	Human resources	Personnel: the core tasks of the EMIS are identified and the EMIS is staffed with qualified people	Qualified staff operate the system and opportunities are available to improve their performance and retention	Minimum standards of qualification are not met for the majority of staff that operate the system and opportunities are not available to improve their performance and retention	Some staff are qualified to operate the system and limited opportunities are available to improve staff performance and retention	The majority of staff are qualified to operate the system and frequent opportunities are available to improve staff performance and retention	All staff are qualified to operate the system and well-established opportunities are constantly available to improve staff performance and retention
		Professional development: professional training is available for EMIS staff					
1.4	Infrastructural capacity	Data collection: tools for data collection are available	The system has a well-defined infrastructure to perform data collection, management, and dissemination functions in an integral manner	The system lacks a well-defined infrastructure	The system has a basic or incomplete infrastructure	The system has an infrastructure that allows it to perform some of its functions in an integral manner	The system has a well-defined infrastructure to fully perform its data collection, management, and dissemination functions in an integral manner
		Database(s): databases exist under the umbrella of the data warehouse and have both hardware and software means					
		Data management system: there is a system in place that manages data collection, processing, and reporting					
		Data dissemination: data dissemination tools are available and maintained by the agency producing education statistics					
1.5	Budget	Personnel and professional development: the EMIS budget contains a specific budget for EMIS personnel and their professional development	The system budget is comprehensive, ensuring that the system is sustainable and efficient	The system suffers from serious budgetary issues	The system has a basic or incomplete budget	The system budget contains the majority of required categories to ensure that most parts of the system are sustainable and efficient	The system budget is comprehensive, ensuring that the system is sustainable and efficient
		Maintenance: the EMIS budget contains a specific budget for system maintenance and recurrent costs					
		Reporting: the EMIS budget contains a specific budget for reporting costs					

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	Physical infrastructure: the EMIS budget contains a specific budget for physical infrastructure costs					
	Efficient use of resources: processes and procedures are in place to ensure that resources are used efficiently					
Data-driven Culture	Data-driven Culture	A data-driven culture prioritizes data as a fundamental element of operations and decision making, both inside and outside of the education system.	The system suffers because there is not a data-driven culture that prioritizes data management and data utilization in decision making.	The system has a data-driven culture that demonstrates a basic appreciation of data and interest in developing better data utilization practices.	A data-driven culture exists that prioritizes data management and utilization within and beyond the education system.	A data-driven culture exists that prioritizes data management and utilization within and beyond the education system and evidence of that culture is present in daily interaction and decision-making at all levels.
POLICY AREA 2: SYSTEM SOUNDNESS		The processes and structure of the EMIS are sound and support the components of an integrated system	The system lacks processes and structure	The system has basic processes and a structure that do not support the components of an integrated system	The system has some processes and a structure, but they do not fully support the components of an integrated system	The processes and structure of the system are sound and support the components of an integrated system
2.1 Data architecture	Data architecture	The data architecture is well-defined to ensure full system functionality	The system's data structure does not have a well-defined data architecture	The system's data architecture includes some components, however, it is incomplete	The system's data structure has most elements of the data architecture, however, it has some deficiencies that affect the system's functionality	The data architecture is well-defined to ensure full system functionality

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2.2	Data coverage	Administrative data: the EMIS contains administrative data	The data in the system is comprehensive and covers administrative, financial, human resources, and learning outcomes data	The data in the system is far from being comprehensive and coverage is limited	The data in the system includes some of the data areas	The data in the system includes most but not all of the data areas	The data in the system is comprehensive and covers all data areas
		Financial data: the EMIS contains financial data					
		Human resources data: the EMIS contains human resources data					
		Learning outcomes data: the EMIS contains learning outcomes data					
2.3	Data analytics	Data analytics	Tools and processes are available to perform data analytics at different levels on a regular basis	There are tools and processes to perform limited tabulations	Basic tools and processes are available, but the system is not capable of conducting advanced analytical steps (e.g., predictive models, projections, etc.)	Tools and processes are available; however, data analytics are not performed regularly	Tools and processes are available to perform data analytics at different levels on a regular basis
2.4	Dynamic system	Quality assurance measures: the system is dynamic and maintains quality assurance measures	The system in place is elastic and easily adaptable to allow for changes/advancements in data needs	The system in place is not easily adaptable to changes/advancements in data needs, as no quality assurance standards are used	The system in place is not easily adaptable and requires significant time and resources to accommodate changes and/or advancements	The system in place is easily adaptable, but it remains reasonably complex	The system in place is elastic and easily adaptable to allow for changes / advancements in data needs
		Data requirements and considerations: there are mechanisms for addressing new and emerging data requirements					
		System adaptability: the EMIS is elastic and easily adaptable to allow for changes and/or advancements in data needs					

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2.5 Serviceability	Validity across data sources: information brought together from different data and/or statistical frameworks in the EMIS is placed within the data warehouse using structural and consistency measures	Services provided by the system are valid across data sources, integrate non-education databases into the EMIS, and archive data at the service of EMIS clients by ensuring the relevance, consistency, usefulness, and timeliness of its statistics	There are serious issues related to data validity and consistency	There are inconsistencies related to data validity and consistency	The data is consistent and valid; however, some concerns still exist	Services provided by the system are valid across data sources, integrate non-education databases into the EMIS, and archive data at the service of EMIS clients by ensuring the relevance, consistency, usefulness, and timeliness of its statistics
	Integration of non-education databases into EMIS: data from sources collected by agencies outside of the EMIS are integrated into the EMIS data warehouse					
	Archiving data: multiple years of data are archived, including source data, metadata, and statistical results					
	Services to EMIS clients: Services provided by the system to EMIS clients include ensuring the relevance, consistency, usefulness, and timeliness of its statistics					
POLICY AREA 3: QUALITY DATA		The system has the mechanisms required to collect, save, produce, and utilize information, which ensures accuracy, security, and timely, high-quality information for use in decision making	The system lacks mechanisms to collect, save, or produce timely, high-quality information for decision making	The system has basic mechanisms to collect, save, and produce timely, quality information; however, its accuracy might be questionable	The system has most mechanisms in place needed to collect, save and produce timely, high-quality information for use in decision making; however, some additional measures are needed to ensure accuracy, security, and/ or timely information that can be used for decision making	The system has the required mechanisms in place to collect, save, produce, and utilize information, which ensures accuracy, security, and timely, high-quality information for use in decision making

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3.1	Methodological soundness	Concepts and definitions: data fields, records, concepts, indicators and metadata are defined and documented in official operations manuals along with other national datasets, and endorsed by the government	The methodological basis for producing educational statistics from raw data follows internationally accepted standards, guidelines, and good practices	The methodological basis for producing educational statistics does not follow internationally accepted standards, guidelines, or good practices	The methodological basis for producing educational statistics follows the basics of internationally accepted standards, guidelines, and good practices	The methodological basis for producing educational statistics follows most required internationally accepted standards, guidelines, and good practices	The methodological basis for producing educational statistics from raw data follows internationally accepted standards, guidelines, and good practices
		Classification: there are defined education system classifications based on technical guidelines and manuals					
		Scope: the scope of education statistics is broader than and not limited to a small number of indicators (e.g., measurements of enrollment, class size, and completion)					
		Basis for recording: data recording systems follow internationally accepted standards, guidelines, and good practices					
3.2	Accuracy and reliability	Source data: available source data provide an adequate basis for compiling statistics	Source data and statistical techniques are sound and reliable, and statistical outputs sufficiently portray reality	Source data and statistical techniques lack soundness and reliability	Source data and statistical techniques have basic soundness and reliability, but statistical outputs do not portray reality	Source data and statistical techniques follow most required elements to be sound and reliable, but statistical outputs do not portray reality	Source data and statistical techniques are sound and reliable, and statistical outputs sufficiently portray reality
		Validation of source data: source data are consistent with the definition, scope, classification, as well as time of recording, reference periods, and valuation of education statistics					
		Statistical techniques: statistical techniques are used to calculate accurate rates and derived indicators					
3.3	Integrity	Professionalism: EMIS staff exercise their profession with technical independence and without outside interference that could result in the violation of the public trust in EMIS statistics and the EMIS itself	Education statistics contained within the system are guided by principles of	Education statistics contained within the system are not guided by principles of integrity	Education statistics contained within the system are guided by limited principles of	Education statistics contained within the system are mostly guided by principles of integrity (2 of the 3	Education statistics contained within the system are guided by all 3 principles of integrity:

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		Transparency: statistical policies and practices are transparent Ethical standards: policies and practices in education statistics are guided by ethical standards	integrity		integrity (1 of the 3 principles of professionalism, transparency, and ethical standards)	principles of professionalism, transparency, and ethical standards)	professionalism, transparency, and ethical standards
3.4	Periodicity and timeliness	Periodicity: the production of reports and other outputs from the data warehouse occur in accordance with cycles in the education system Timeliness: final statistics and financial statistics are both disseminated in a timely manner	The system produces data and statistics periodically in a timely manner	The system produces data and statistics neither periodically nor in a timely manner	The system produces some data and statistics periodically and in a timely manner	The system produces most data and statistics periodically and in a timely manner	The system produces all data and statistics periodically and in a timely manner
POLICY AREA 4: UTILIZATION FOR DECISION MAKING			The system is wholly utilized by different users for decision making at different levels of the education system	There are no signs that the EMIS is utilized in decision making by the majority of education stakeholders	The system is used by some education stakeholders, but not for major policy decision making	The system is used by most education stakeholders, but is not fully operational in governmental decision making	The system is wholly utilized by different users for decision making at different levels of the education system
4.1	Openness	EMIS stakeholders: EMIS primary stakeholders are identified and use the system in accordance with the legal framework User awareness: current and potential EMIS users are aware of the EMIS and its outputs User capacity: EMIS users have the skills to interpret, manipulate, and utilize the data produced by the system in order to ultimately disseminate findings	The system is open to education stakeholders in terms of their awareness and capacity to utilize the system	The system lacks openness to education stakeholders in terms of their awareness and capacity to utilize the system	The system is open to some education stakeholders in terms of their awareness and capacity to utilize the system	The system is open to the majority of education stakeholders in terms of their awareness and capacity to utilize the system	The system is open to all education stakeholders in terms of their awareness and capacity to utilize the system
4.2	Operational use	Utilization in evaluation: Data produced by the EMIS is used to assess the education system	Data produced by the system is used in practice by the	Data produced by the system is not used in practice by	Data produced by the system is used in practice	Data produced by the system is used in practice by the	Data produced by the system is used in practice by the

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		Utilization in governance: Data produced by the EMIS is used for governance purposes	main education stakeholders	education stakeholders	by some education stakeholders	majority of education stakeholders	main education stakeholders
		Utilization by schools: Data produced by the EMIS is used by schools					
		Utilization by clients: data produced by the EMIS is used by clients (including parents, communities, and other actors)					
4.3	Accessibility	Understandable data: data are presented in a manner that is easily digestible	Education statistics are presented in an understandable manner, are widely disseminated using clear platforms for utilization, complemented by user support	The system suffers from serious accessibility issues	The system has major accessibility issues	The system has minor accessibility issues	Education statistics are presented in an understandable manner, are widely disseminated using a clear platform for utilization, complemented by user support
		Widely disseminated data: education statistics are disseminated beyond the Ministry of Education and/or the education statistics-producing agency to other EMIS stakeholders					
		Platforms for utilization: platforms are standardized across the EMIS and are customizable to user needs					
		User support: assistance is provided to EMIS users upon request to help them access the data					
4.4	Effectiveness in disseminating findings	Dissemination strategy: national governments have an information dissemination strategy in place	Dissemination of education statistics via an EMIS is strategic and effective	Dissemination is neither strategic nor effective	Dissemination is reasonably strategic, but ineffective	A dissemination plan has been implemented; however, there is room for improvement (for full effectiveness in relation to strategic engagement)	The dissemination of education statistics via an EMIS is strategic and effective

The Systems Approach for Better Education Results (SABER) initiative collects data on the policies and institutions of education systems around the world and benchmarks them against practices associated with student learning. SABER aims to give all parties with a stake in educational results—from students, administrators, teachers, and parents to policymakers, business people and political leaders—an accessible, detailed, objective snapshot of how well the policies of their country's education system are oriented toward delivering learning for all children and youth.

This report focuses specifically on policies in the area of Education Management Information Systems.

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