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Analysis of the Education Management and Information System of Jamaica

Diagnosis and proposal for strengthening the EMIS

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Education Divison

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ANALYSIS OF THE EDUCATION MANAGEMENT AND INFORMATION SYSTEM OF JAMAICA

DIAGNOSIS AND PROPOSAL FOR STRENGTHENING THE EMIS

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Community Systems Foundation

DECEMBER 2022

IDB

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PROLOGUE

This document analyzes the functioning of the Education Management and Information System (EMIS) of Jamaica, its strengths and challenges related to the key management processes and structural conditions. A survey methodology was used for the analysis of the six key management processes - (i) Physical infrastructure and equipment; (ii) Schools[1]; (iii) Human resources, budget and finance; (iv) Students and learning; (v) Digital content for teacher training and students' learning; and (vi) Tools for strategic management - and the two structural conditions - (i) Technological infrastructure and (ii) Governance and institutional arrangements. There are several main findings. In terms of strengths, the analysis shows that the processes of human, financial and budgetary resources present the highest percentage of subprocesses in the Established level and that technological infrastructure pre-requisites are in place to sustain the improvement of the EMIS. However, EMIS sub-systems are dispersed and poorly integrated and are not covering all the needs of management processes related to the EMIS. The Ministry of Education and Youth and Information (MOEYI)[2] also has an urgent need to develop a comprehensive and realistic strategic plan for the implementation of its EMIS and to ensure the initial and recurrent funding associated with it. Nor is there a change management plan at the MOEYI to support the evolution of the EMIS at all levels. Overall, the MOEYI is at a critical stage of its EMIS transition from a census based EMIS to a transactional information system able to track real-time information about each student, teaching and non-teaching workforce, school infrastructure and assets. This paper outlines a strengthening proposal.

The EMIS analysis in this document was carried out in Jamaica in 2019 as part of a series of studies in several countries of Latin America and the Caribbean (LAC) that aim to increase our knowledge about EMIS best practices and the level of development achieved in the LAC countries. All findings and recommendations in this document answer to the state of the EMIS of that particular moment in time, but the Ministry has confirmed that they remain relevant.

1 In this document, «school» refers to pre-primary, primary and secondary institutions, including technical and vocational.

2 This study was carried out in 2019. Since then, the Ministry of Education, Youth and Information (MOEYI) has changed to the Ministry of Education and Youth (MOEY). The findings and recommendations remain relevant.

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Pierre Chapelet is an international development expert specialized in education management information systems. The author is currently working at UNESCO Headquarter in the Section for Education Policy (EPS). At the time that he carried out this study, he was a consultant for Community Systems Foundation (CSF)[3]. The author is grateful for the direction and technical assistance of Elena Arias Ortiz and Cynthia Hobbs of the Education Division of the Inter-American Development Bank and Madiery Vasquez Rodríguez, IDB consultant. The author also acknowledges the local support provided in Jamaica by the authorities of the Ministry of Education, Youth and Information, including the Permanent Secretary and her executive team. We would also like to highlight the commitment and dedication of the Ministry's technical staff for their generous participation in the interviews and sharing of additional documentation to prepare this report. The opinions expressed in this publication are those of the author and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.

3 https://www.communitysystemsfoundation.org/.

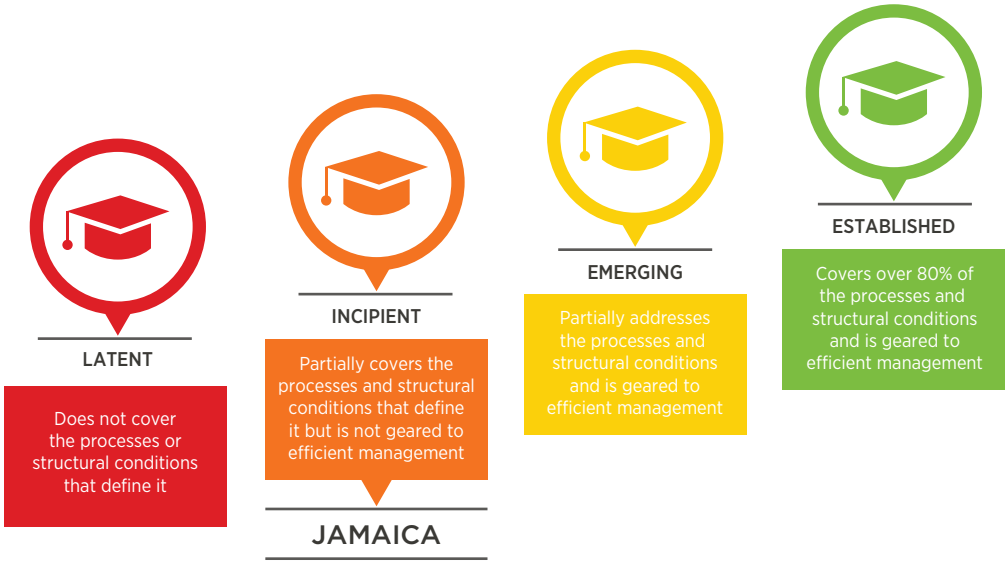
LIST OF ACRONYMS

BI	Business Intelligence
CAPE	Caribbean Advanced Proficiency Examination
CSEC	Caribbean Secondary Education Certificate
CSF	Community Systems Foundation
CSP	Community Service Program
CXC	Caribbean Examination Council
DMF	Data Management Framework
DSS	Department of School Services
EMIS	Education Management Information System
ESTP	Education System Transformation Programme
FOSS	Free and Open Source Solutions
GCE	General Certificate of Education
GFMIS	Government Finance Management Information System
GOILP	Grade One Individual Learning Profile
GNAT	Grade Nine Achievement Test
GSAT	Grade Six Achievement Test
ICT	Information and Communication Technology
IDB	Inter-American Development Bank
JHSC	Junior High School Certificate
JMD	Jamaican Dollar (1 JMD = 0.0074 USD as of 11/08/2019)
JSC	Jamaica School Certificate
JTC	Jamaica Teaching Council
LCMS	Learning Content Management System
LMS	Learning Management System
MOEYI	Ministry of Education, Youth and Information
MOFPS	Ministry of Finance and Public Service
MSET	Ministry of Science, Energy and Technology
NCEL	National College for Educational Leadership
NEI	National Education Inspectorate
NET	National Education Trust

NID	National Identification Number
NIDS	National Identification System
NSRS	National Student Registration System
OPM	Office of the Prime Minister
PATH	Program of Advancement through Health and Education
PEP	Primary Exit Profile
PWC	PricewaterhouseCoopers
REO	Regional Education Office
SIGED	Spanish acronym for EMIS
SOP	Standard Operating Procedures
SSC	Secondary School Certificate
STATIN	Statistical Institute of Jamaica
TIS	Tablets in School
TCO	Total Cost of Ownership
TRN	Tax Registration Number
UIS	UNESCO Institute for Statistics
UNESCO	United Nations Educational, Scientific and Cultural Organization
WEP	Work Experience Programme

1 EXECUTIVE SUMMARY

FIGURE 1.1: **CLASSIFICATION OF JAMAICA'S EMIS**

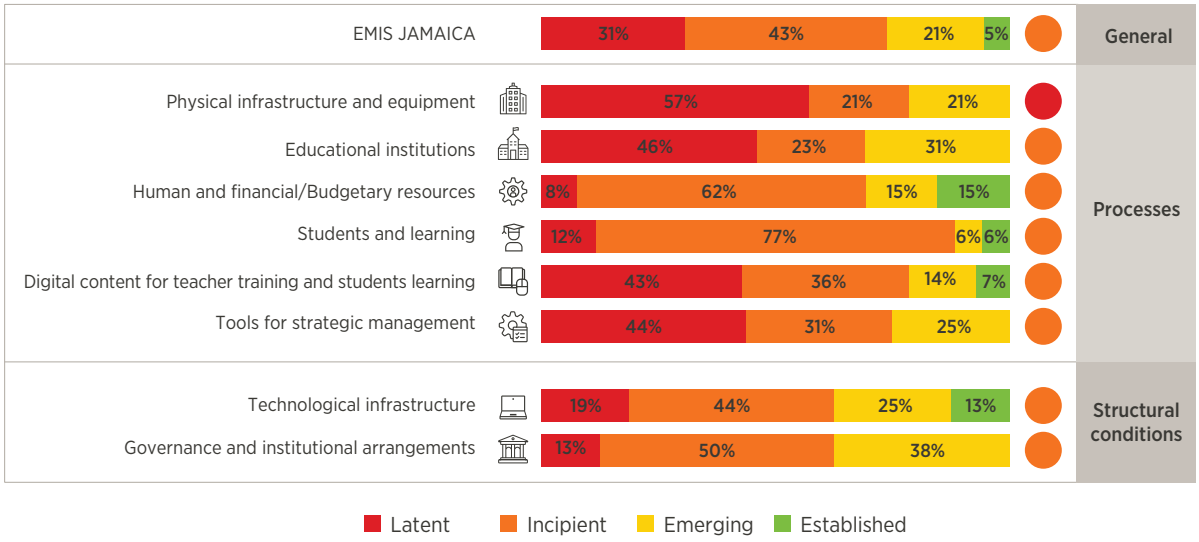


Source: Arias Ortiz et al. (2019).

According to the rating system established under the IDB's regional study, which measures the degree to which a country's management and information system is functioning, the Education Management and Information System (EMIS) of Jamaica is in an Incipient state of development (2).

The detailed graph below shows that 26% of all subprocesses analyzed have an Emerging (21%) or Established (5%) level of development. The Management of Human and Financial Budgetary resources is the process with the highest percentage of established subprocesses (15%). Physical infrastructure and equipment is the process with the lowest level of development (Latent), with 57% of its subprocesses classified as Latent and 21% as Incipient. Technological Infrastructure is the structural condition with the highest percentage of established subprocesses, with 38% of subprocesses classified as Emerging (25%) or Established (13%). In Governance and Institutional Arrangements, 38% of the subprocesses analyzed are Emerging, but no subprocess is at an Established level of development.

FIGURE 1.2 **: CLASSIFICATION OF JAMAICA'S EMIS BY CATEGORY**



Source: own elaboration.

Management Processes

1 – MANAGEMENT OF PHYSICAL INFRASTRUCTURE AND EQUIPMENT	
STRENGTHS	**CHALLENGES**
• Basic statistical information about building and equipment is captured by the annual School Census. • Available information is used for school mapping and supply/demand analysis.	• All sub-processes are paper based. • Absence of unique identifier for buildings. • Absence of a unique register of buildings in digital format for use in the daily management of educational institutions. • Incomplete georeferencing of school buildings. • School shift information is not linked to building information. • State of conservation of the buildings is not recorded in the EMIS. • The classrooms that operate for each school and in each shift are not accurately recorded. • Building and equipment maintenance requirement information is not digitalized • Building interventions are not digitally recorded in the building register (with date, project executed, investment, contractor company). • The MOEYI does not have information in real time and accurate data managed in a single register of buildings, with views and privileges associated with the various actors of the education system (Director, Supervisor, Administrative Areas, Political Leadership Level).

2 – MANAGEMENT OF SCHOOLS	
STRENGTHS	**CHALLENGES**
• Schools are managed by means of a unique school identification code. • All information and management systems use the school's unique identification code. • The MOEYI implements comprehensive management based on registers of educational institutions where key data of each school is found. • Information on curricula, administrative position assignment to schools reflects their changing dynamics, linking them to different sections or groups of students.	• Presently the MOEYI does not have a sector-wide single system to store and maintain the information on schools which could be used to inform decisions at all administrative levels, including at the school level. • EMIS coverage of the private sector remains incomplete.The EMIS does not enable assignment of curricula items to institutions with scheduling of each subject/position (scheduling), and with the assignment of a responsible teacher and the students assigned to them. • There is an absence of a centralized management of curricula offered in schools through EMIS, systematizing the evolutionary history of administrative position requirements, curricula and services that are provided and eventually terminated. • The EMIS does not contain digitized information to manage the grouping of students in shifts, sections, criteria for categorizing schools and regulations regarding the minimum spaces required per student per classroom. • The EMIS is not able to record school occupancy shifts in the building. • Management of monthly transfers for expenses managed by schools is not systematized in the EMIS. • There is no available immediate emergency assistance fund mechanism for schools (FIA) through an EMIS. • Information related to educational material received by schools is not recorded nor updated in the EMIS. • There is an absence of a system to deliver information in real time from the data managed in the single register of schools, with views and privileges associated with the various actors of the education system (Director, Supervisor, Administrative Areas, Political Leadership Level).

3 – MANAGEMENT OF HUMAN AND FINANCIAL/BUDGETARY RESOURCES	
STRENGTHS	**CHALLENGES**
• A unique model is implemented for the identification of positions in the education system and their association with the budget. • There are systematized processes for budget administration that allow budgets to be defined by schools. • Unique personnel records contain history of administrative positions occupied by staff. • Salary settlements are based on information from the personnel register and from the budget.	• HR thematic records are scattered across different units (such as JTC for teacher's registration and professional development), leading to some duplication and potential data quality issues. • Although demand is the main factor to define teaching position requirements in schools, in public schools teacher's mobility is limited. • The management of medical and administrative replacements is not systematized. • HR hires are not systematically registered in real time in the EMIS. • Teacher in-service and pre-service training information is not yet centralized in the EMIS. • Teachers do not have the possibility to consult their own teaching record on the Internet, including appropriate security restrictions. • There is no periodic electronic online register for the evaluation of the school environment, with the level of satisfaction of the teachers. • Results of external evaluations of teachers are not systematically recorded and managed in the EMIS. • The EMIS does not deliver accurate and real-time information of all data recorded in the Personnel Register such as total number of occupied and vacant positions, current and historical services of the agents, medical history and absences, with views and privileges associated with the managers of the educational system. Relevant actors have limited access to some information from the personnel/staff register.

4 – MANAGEMENT OF STUDENTS AND LEARNING

STRENGTHS	CHALLENGES
• The MOEYI has a documented and proven experience for deployment and implementation of a national student management information system (NSRS). • The MOEYI relies on an Annual School Census to collect basic information about student enrolments. This information is used for planning and management within MOEYI. • The MOEYI implements a comprehensive student learning assessment programme through the Grade One Individual Learning Profile (GOILP) and Primary Exit Profile (PEP) components of the National Standards Curriculum (NSC). The programme relies on NSRS to record key results of the student assessments. • The MOEYI uses the results of student assessments to inform educational practices and policies.	• There is not yet a comprehensive student directory covering all levels and using the unique School-Education Programme-Section-Student identification model to identify the school, curriculum, and section each student belongs to. • The above information is not used to manage the opening and closing of teaching positions based on demand. • Student information from the single registry is not used to generate information required by other public or international bodies on a regular basis. • Student information from the single registry is not used to issue certification of studies, pass records, exams, and processing of promotion and repetition through the system. • The scope of information captured by student level systems currently in place remains limited. Student behavior and attendance are not monitored in the EMIS. • Student registration and enrollment is not managed online in the EMIS. • School transportation services and scholarships are not systematically managed in the EMIS. • Parents and guardians do not have online access to updated information pertaining to their pupils in schools. • Overall, the EMIS does not deliver accurate, real-time information on all data recorded in a single student record with views and privileges associated with education system managers (Director, Supervisor, Administrative Areas, Political Leadership Level).

5 – MANAGEMENT OF TEACHER TRAINING AND DIGITAL CONTENT FOR STUDENTS

STRENGTHS	CHALLENGES
• The MOEYI implements an annual professional development plan for teachers, based on new curricular demands and student learning challenges, which guarantees access to the plan, regardless of the teacher's place of residence. • An E-content committee was established in the MOEYI Media Service Unit to review and approve electronic contents to be procured. The committee consists of curriculum specialists. Private publishers and individuals can propose contents for online publication. • The MOEYI acquired packages of digital resource repositories to support curricular training from specialized publishers and to use these resources.	• The MOEYI does not yet implement comprehensive digital support and monitoring tools for the teacher's professional development plans. • Teachers have limited access to digital content for their professional development and this content is partially incorporated into Learning Management Systems (LMS) tools. • The MOEYI implements fragmented tools to support and monitor student learning and skills development. • The MOEYI does not perform virtual tutoring. • Teacher training in the use and generation of digital content for the formation of student learning and skills is at an incipient stage. • Promotion of the generation of digital resources used for the formation of learning and skills of students from schools is at a latent stage. • The MOEYI does not encourage the publication of innovative pedagogical experiences developed in schools in terms of digital pedagogical resources used for the formation of student learning and skills. • Although an E-content Committee is established, the MOEYI does not have an IT process for the management of digital content that provides virtual monitoring from the generation, the analysis of the resource, use of content, evaluation and subsequent publication. • Use of ICTs and digital resources by teachers and students is not recorded.

6 – TOOLS FOR STRATEGIC MANAGEMENT	
STRENGTHS	**CHALLENGES**
• The MOEYI generates a basic set of quality education indicators from the annual school census for planning and management, including on the quality of education delivery. • The MOEYI generates summary statistics on school progression and analyzes student flows in the education systems. • The MOEYI conducts comprehensive multi-level student performance assessments which are analyzed. • The MOEYI has qualified human resources to design, produce, analyze and disseminate dashboards.	• The MOEYI does not implement business intelligence (BI) tools that provide online information through dashboards. • The MOEYI does not generate dashboards with updated and consolidated information on management indicators for teacher performance, positions, absenteeism, wage expenses and investments, student-teacher relations, learning context, • The MOEYI does not have a system allowing for the generation/visualization of individual or combined student performance indicators for different levels, that allows comparison between sections, schools and administrative areas over time. • The MOEYI consolidates information from the entire education system, including the private sector and subsidized/concessional schools. However, the MOEYI faces issues of coverage of the private sector. This is especially true in the dynamic pre-primary education sub-sector. • The scope of the existing school profile publication could be expanded, and data used to produce interactive dashboards comparing education offer and school performance across Jamaica. • The MOEYI does not have any tool (e.g. software) to detect learning challenges or risks of drop-out in a timely manner. • EMIS users are not able to build their own dashboards based on available data.

Structural Conditions

1 – TECHNOLOGICAL INFRASTRUCTURE	
STRENGTHS	**CHALLENGES**
• The MOEYI has adequate connectivity for schools, and administrative and pedagogical management at central and regional levels. • The MOEYI has established technological infrastructure for the processes handled by EMIS that meets the demand of schools and Ministry departments for network access to information, with redundancy in the production environment, availability of testing environments and backup procedures. • There is availability of operational manuals for the main EMIS sub-systems, which is not common in many education systems.	• School connectivity speed remains a challenge. • Not all public schools have working basic ICT equipment such as computers (particularly in infant and primary schools). • Auditing processes on sensitive data that can be modified by system users are not in place. • Technical documentation on EMIS components is not always available and is not up to date. • Some key EMIS applications are running on very old technologies which are no longer supported (ex: FoxPro). • The MOEYI has some dispersed measures of identity authenticity protection for system users which are not standardized across EMIS sub-systems. • The MOEYI does not have an established policy for maintenance and technological support of EMIS components. • Integration of EMIS sub-systems is limited. • EMIS sub-components operate in silos with duplication of information.

2 – GOVERNANCE AND INSTITUTIONAL FRAMEWORK	
STRENGTHS	**CHALLENGES**
• There is rapid emergence of e-governance policies at government level, where the MOEYI is prioritized. • An ICT in Education Policy exists along with a draft master plan for its implementation with information systems as a crosscutting dimension. • There are regulations that protect the privacy of the information contained in the EMIS and that regulate their use to guarantee an ethical use (but they are implemented partial). • The MOEYI has a strategic vision for development of its EMIS articulated in its ICT in education strategy. Technical and functional requirement documentation exists.	• Regulations that protect the privacy of the information contained in the EMIS and that regulate their use are not yet fully implemented. • The MOEYI does not have an EMIS strategic plan endorsed by the highest authorities within the ministry. • The MOEYI has limited human resources to develop and maintain all the EMIS applications. • There are no detailed cost estimates for building the envisioned EMIS. Limited financial resources are available, and resources are not budgeted for the long-term. • There is no plan in place to manage the EMIS transformation.

General Recommendations

Central Level

1. Implement the proposed EMIS strengthening plan, which will allow the MOEYI[4] to move its EMIS from an Incipient state to a high-impact EMIS. This requires taking action in each of the processes and structural conditions reviewed in this study.

2. Urgently prepare an EMIS strategic plan supported by a change management plan. This should include the creation of a new and robust governance and leadership system with key stakeholders, to set the priorities and phases for the implementation of the EMIS strengthening plan.

3. Develop and implement a Data Management Framework (DMF).

4. Deploy an integrated EMIS solution built on a set of core thematic datasets crosscutting all management processes.

5. Implement advanced data management and reporting features for executive and administrative levels: statistical data warehouse, online data analysis and dashboard application, online result-based management platform.

4 This study was carried out in 2019. Since then, the Ministry of Education, Youth and Information (MOEYI) has changed to the Ministry of Education and Youth (MOEY). The findings and recommendations remain relevant.

School Level

1. Provide schools with adequate IT equipment for administrative management, as well as improved connectivity.

2. Consider schools as data users rather than data providers. In this regard, set up an online school management platform allowing all schools to manage their files and to facilitate their day-to-day operations. Integrate learning management systems (LMS) and learning content management systems (LCMS) in the technical solution.

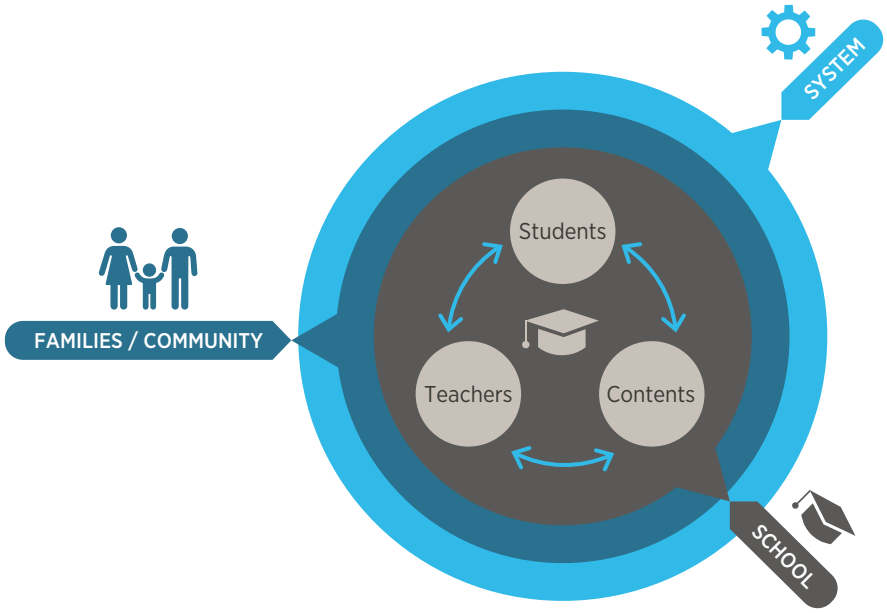
3. Ensure full coverage of the private sector in the EMIS.

4. Implement a portal for teachers and staff of the education system, with full access to their single register and all its associated data.

2 INTRODUCTION

This document analyzes the main processes that every Education Management and Information System (EMIS) must consider in order to have a high impact on an efficient management model of educational resources. Figure 2.1 shows the key elements to be managed in an educational system.

FIGURE 2.1: **ELEMENTS OF THE EDUCATIONAL SYSTEM**



Source: Arias Ortiz et al. (2019) based on Cohen and Ball (1999).

A "system" is understood as an ordered set of norms and processes that are interrelated and that interact with each other, regulating the functioning of a group/organization to achieve an objective. An educational system can be defined as a structure formed by various components whose main objective is to educate the population. Schools, teachers, students, content, administrative areas of the state, among others, are part of this system.

The State is responsible for the management and regulation of the education system. Through the Ministries of Education, or similar bodies, the foundations are laid for the development of education in a given territory. Study programs are defined and the basic guidelines for schooling are established.

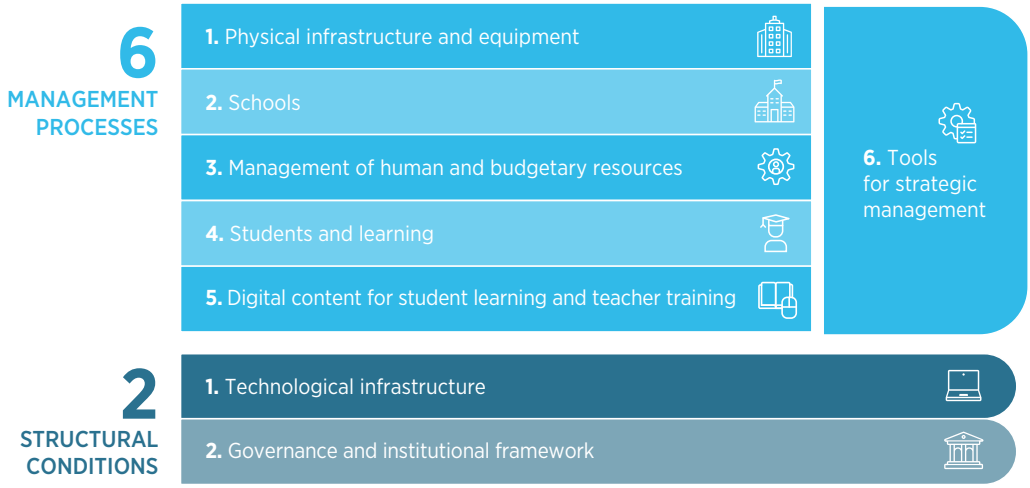
An EMIS has a series of associated management processes and subprocesses that represent the core of the educational management model. Identifying, analyzing and evaluating these processes is key to determine their effectiveness in the education system studied.

An EMIS can be defined as a set of educational management processes that design, record, exploit and generate strategic information online in a comprehensive manner, framed by specific legal, institutional and technological infrastructure.

Management Processes and Structural Conditions of an EMIS

The following figure presents each of the processes and the structural conditions of an EMIS (Figure 2.2). For each one, the necessary characteristics of a high impact system are defined below.

FIGURE 2.2: **MANAGEMENT PROCESSES AND STRUCTURAL CONDITIONS OF AN EMIS**



Source: Arias Ortiz et al. (2019).

Physical Infrastructure and Equipment

This process includes all subprocesses related to school environments and their adaptation to the school curriculum. It incorporates the updated information corresponding to the buildings, the space distribution, the inventory and the available services. It covers the different building maintenance needs, allowing for scheduled maintenance and inspections through the EMIS. The process provides information in real time of the data managed in the unique record of buildings, with views and privileges associated with the various managers of the education system (director, supervisor, local manager, administrative areas, political level).

Schools

This process includes all subprocesses related to the management of schools. The data regarding the schools that operate in each building are recorded and a unique school record is implemented to support the management of the study plans, the functional organic structures, the services that are provided, the students that attend, the educational elements that are delivered to each school and the changing dynamics of the school, linked to the different sections and groupings of students.

In addition, it incorporates the management of educational and curricular planning, including the definition of the curricula, the curricular structures and the grid of charges for each school and the management of the schedule of subjects and teaching positions within each school (scheduling), with the assignment of teachers and students to each group/section.

The process provides real-time and accurate information of the data managed in the school record, with views and privileges associated with the different managers of the education system.

Human and Financial/Budgetary Resources

The management of human and financial/budgetary resources includes all the subprocesses related to budget administration by schools, which regulates the authorization functions to eliminate or create staff vacancies. All the data of the characterization and performance of each teacher, applicant or worker of the education system constitutes a complete and unique record of all human resources.

The subprocesses of human resources cover the registry of services, certificates of family allowances, seniority, training courses and the resolution of claims and adjustments, becoming the sole source of information for the payment of remunerations. These subprocesses are completely integrated to the management of teaching positions and budget and to the management of teaching scales.

The process provides real-time and accurate information of all the data recorded in the human resources record, such as occupied and vacant positions, substitution roster by type of function, current and previous positions, clinical history and absences, with views and privileged access associated with the different management roles in the education system.

Students and Learning

In terms of students and learning, the process includes all the subprocesses related to the nominal management of students, implementing a unique record of students. This record includes student personal data, academic (digital reports), socio-educational, behavioral, and health records, as well as education certificates, records of passes, exams, promotion, repetition and centralized management of certifications.

It also includes the subprocesses that allow managing online enrollment of students for each school year, with automatic assignment to schools, in accordance with the regulations established in the jurisdiction. It incorporates online information delivery for parents.

The process provides real-time and accurate information of all data recorded in the unique student record, such as personal, academic and social data, with views and privileged access associated with the different management roles in the education system.

Digital Content for Student Learning and Teacher Training

This process includes all subprocesses related to the management of tools and digital content for student learning and teacher training based on curricular demands, guaranteeing access regardless of the teacher's place of residence.

In addition, the management of digital content for student learning and teacher training covers the virtual (asynchronous and/or synchronous) cross-tutorial schemes, understood as a support action for specific topics of the students' curriculum.

The process provides real-time and accurate information of all data related to the background of teacher training and the background of curricular support for students, with views and privileged access associated with the different management roles in the education system.

Tools for Strategic Management

Tools for strategic management include all subprocesses related to the delivery of up-to-date and consolidated information on management and learning indicators such as: individual and combined pedagogics, teaching positions, sick and administrative leave, payment of remunerations, teacher-student ratios, occupation of school buildings, total investment per school vs. academic performance, investments in student assistance (transportation, food, scholarships), ratio of hours and positions to the number of students.

These indicators are delivered to the different management levels: section/group, school, supervision, educational level, regional and central administration, education system and society.

In addition, this process includes all subprocesses associated with having accurate information to lead and make decisions based on the objectives set by management, allowing for interpretation of the performance of the processes, programs and projects of each level of the EMIS, identifying deviations or variations with respect to the objectives.

Technological Infrastructure

This implementation framework includes the aspects related to the availability of technological infrastructure according to the demand and scope of the projects, with differentiated schemes and redundancy in production.

It also covers the automatic audit mechanisms on sensitive data modified by the users of the systems and the technical and operational documentation of the information systems implemented.

It also incorporates connectivity arrangements (for schools and administrative areas), cybersecurity aspects and the use of integrated systems and platforms that are compatible and interoperable with each other.

Governance and Institutional Framework

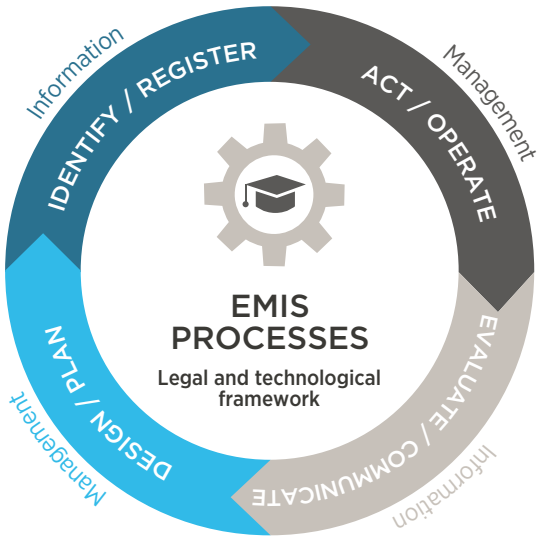
This process includes the strategic vision at the highest level of management in terms of information and management systems; and the availability of a comprehensive-strategic project that includes the optimization of institutional processes based on the support provided by new technologies.

Related to the strategic project, it incorporates the availability of resources for its execution in the short, medium and long term, considering the financial and human resources and the established norms that give sustainability to the optimized processes and to the support systems.

Cycle of the EMIS Processes

Diagram 2.3 shows the ideal internal cycle that occurs in each of the EMIS processes. The actions have an internal interaction, with a feedback mechanism that produces effects-results on the EMIS. Thus, each cycle of the processes starts with the “identification and registration” of the data associated with it, which allows precise records to “act and manage” the resources of each process. This then makes it possible to “evaluate and communicate” the results of this process in the context of the EMIS and, subsequently, to “design and plan” new actions to improve the Educational System.

DIAGRAM 2.3: **CYCLE OF THE EMIS PROCESSES**



Source: own elaboration.

These processes must provide accurate, updated and real-time information of the managed data, with views and privileged access associated with the different actors in the education system (teacher, student, parent, director, supervisor, administrative areas, policy level).

The legal infrastructure includes the standards (laws, decrees, resolutions, dispositions, etc.) that provide the regulatory framework for optimized processes. The technological infrastructure refers to all elements of hardware, software and connectivity that provide the adequate support for the implementation of computer solutions (among them are servers, storage devices, basic software, aspects of cybersecurity, elements of connectivity, etc.).

In the following sections, a detailed analysis of each process and structural condition is performed to determine how closely it adheres to the characteristics of a high impact system. In this sense, it is understood as an effective system or with adequate orientation if each process or sub-process is capable of producing the expected results. In the theoretical definition, an effective system is reached if the processes analyzed have a sequence of repeatable steps and are deterministic, that is, they always deliver the same outputs for the same sets of inputs.

In practical terms, the online student enrollment management subprocess is effective if each year, in the month of enrollment, all the families of the students can perform the process autonomously (they are trained to do it), the support system operates in a stable manner and validates the data entered, the security standards are met in the computerized management of the data and the process is carried out in the foreseen timeframe, without delays. In addition, this process provides information to the different managers about enrollment, pre-assignment of students to schools and pre-registrations that could not be automatically assigned.

Another example of an effective process with adequate orientation can be seen in the payment of teacher salaries. In this case, the process and its support system must use the data previously registered in the human resource record (hours, charges, absences, seniority, family allowances, union discounts, etc.) as the only source of information for the payment of salaries, with no possibility of using other satellite systems, registering an audit log of each step that was executed until reaching the final payment of all human resources. This process must deliver, every month for the stipulated date, the summaries of payments with global data for the budgetary allocations, the corresponding salary receipts of each teacher and the necessary files to manage the bank deposits.

3 CONCEPTUAL FRAMEWORK AND DIAGNOSTIC METHODOLOGY

In recent years, the education systems of Latin America and the Caribbean (LAC) have made remarkable progress in expanding coverage at all levels. However, going forward, the challenge will no longer be to get more students in school, but to ensure that all those who attend acquire the knowledge and skills necessary to be successful throughout life (Pritchett L., 2015; Vegas and Petrow, 2008). The new challenge of improving the quality of teaching involves more complex policy decisions and imposes more sophisticated organizational requirements, with high coordination and integration among its actors. The achievements in the system will no longer come from its expansion, but will be generated internally, on the management side: making things better every day and efficiently using scarce resources. In other words, the space for improvement has to do with organizational transformation, optimization of processes and generation of information that provides continual feedback for management.

An effective EMIS generates and distributes integrated, relevant, timely, reliable, and easy to interpret data at all levels of the system. Its contribution is manifested throughout the whole process of education management, from the formulation of policies to the monitoring of its implementation, and to the evaluation of its effectiveness. An EMIS is more than a platform for information management, its true potential lies in its ability to provide information to improve management.

In this context, an instrument was developed to gather information and diagnose the six (6) key processes: (i) physical infrastructure and equipment; (ii) schools; (iii) human resources, budget and finance; (iv) students and learning; (v) digital content for teacher training and student learning; (vi) and tools for strategic management; and the two (2) structural conditions of an EMIS: (i) technological infrastructure and (ii) governance and institutional framework.

The objective of this project is to generate knowledge about the current state of development and lessons learned from the EMIS. Each process and structural condition will be classified according to the strengths and challenges observed. Based on these parameters, the EMIS is classified as shown in Diagram 3.1.

DIAGRAM 3.1: **CLASSIFICATION OF THE EMIS**

Source: Arias Ortiz et al. (2019).

Latent: An EMIS is defined as "Latent" when it does not address the central processes and structural conditions that define it. If a subprocess does not do what was expected according to the definition of an EMIS regarding that process, it will be classified as "Latent".

Incipient: An EMIS is defined as "incipient" when it has a partial approach to the central processes and structural conditions that define it but requires a reorientation to achieve the objectives. If a subprocess has a partial coverage and does not do what was expected according to the definition of an EMIS regarding that process, it will be classified as "Incipient".

Emergent: An EMIS is defined as "Emergent" when it has a partial approach to the core processes and structural conditions that define it and its orientation is adequate but does not have the expected scope to achieve all the objectives. If a subprocess has the orientation of the definition of an EMIS regarding that process but its scope is partial, it will be classified as "Emergent".

Established: An EMIS is defined as "Established" when it has achieved more than 80% of the central processes and structural conditions that define it and its orientation is adequate for achieving the objectives. Additionally, over 80% of the subprocesses are systematized. If a subprocess has the appropriate orientation, has a scope of over 80% and is systematized according to the definition of an EMIS regarding that process, it will be classified as "Established".

To arrive at a diagnosis of the development of each process and structural condition, the information-gathering instrument applies a series of closed-ended questions (between nine and 18 questions per process) about the functionalities that should be performed by an established EMIS to integrate the interactions of the instructional core[5] (see Arias Ortiz et. Al., 2021). The instrument comprises a total of 119 questions of which 113 closed-ended questions are used to calculate the EMIS's level of development[6].

The instrument allows each question to be assigned a score, with discrete values between 1 and 4, depending on the functionality's level of development. The score awarded to each of the items evaluated (sub-processes) reflects the level of development observed in it: latent (1), incipient (2), emergent (3) or established (4)[7]. Each answer is also accompanied by a brief qualitative description that justifies the score assigned to the item evaluated.

The EMIS's score is calculated using two levels of analysis. First, the median of the evaluation of all the corresponding questions is calculated for each of the six processes and two structural conditions. In this way, it is possible to identify the system's level of development in each of the areas analyzed. Second, the global EMIS score is obtained as the median of the evaluation the system has obtained for the six processes and two structural conditions.

Use of the median as a measure of central tendency for calculating the global score implies that the same relative weight is given to each of the processes and structural conditions. In practice, however, the processes for managing human and budgetary resources and students and learning, as well as the two structural conditions (technological infrastructure and governance and institutional framework) are of greater relevance. The structural conditions represent the contextual environment required for the optimization of all the processes while the management of human and budgetary resources, as well as of students and learning, involves the central aspects of any education system. In addition, according to expert opinion, they should be the starting point of any optimization process because management based on the unique identification of teaching positions, school places, budget allocations, teachers and students is the basis and transversal axis of EMIS improvement. These functionalities are key to decisively improving the use of the resources administered by the region's education ministries.

This methodology permits the classification not only of the processes and structural conditions, but also of each EMIS analyzed, according to their level of development as latent (1), incipient (2), emergent (3) or established (4), as shown in Figure 3.1.

5 Of the total 113 questions, 16 refer to the structural condition of technological infrastructure; nine to the structural condition of governance and institutional framework; 14 to the process of managing physical infrastructure and equipment; 13 to the management of schools; 13 to the management of human and financial/budgetary resources; 18 to the management of students and learning; 14 to the management of digital content for student learning and teacher training; and 16 to tools for strategic management.

6 Six of the instrument's questions are open-ended and are designed to document the IT systems and platforms used in each management process.

7 If a sub-process does not perform as expected according to the EMIS definition (for that process), it is classified as latent. If its coverage is partial and it does not fulfill the orientation of the EMIS definition (for that process), it is classified as incipient while, if it fulfills the orientation of the EMIS definition (for that process), but its coverage is partial, it is classified as emergent. Sub-processes that have a proper orientation and a coverage of more than 80% and are systematized in relation to the EMIS definition are classified as established.

Information is gathered in a field visit during which discussions, guided by an instrument, take place with the users and managers of each of the EMIS's processes and structural conditions. As a key part of the field visit, at least one school operating with the EMIS is visited. The project team meets with the school director and, in some cases, also with teachers and administrative personnel. The aim of this visit is to capture the user experience at the school level, considered the primary management unit of the educational model[8].

All the information gathered during the field visit, and in subsequent communications when needed, constitute the main input for the formulation of the diagnosis and strengthening plan.

8 For further information about the fieldwork and information-gathering instrument, see Appendix A of Arias et. al. (2021).

4 MAIN CHARACTERISTICS OF THE JAMAICA EDUCATION SYSTEM

4.1 General Organization of the Education System

MOEYI Mandate

Since gaining independence from the United Kingdom in 1962, Jamaica's education system has undergone several changes, evolving from a church-owned school system offering education to the elite, to a predominantly government-owned and operated system catering for all children irrespective of socio-economic status. The Ministry of Education and Social Welfare was established in 1953 with the ultimate statutory responsibility and authority for the provision and development of education in Jamaica. Most recently, the Youth and Information portfolios were re-added in 2016 to the public institution, which became the Ministry of Education, Youth and Information (MOEYI)[9].

The MOEYI executes the Government's mandate of managing an education system that secures quality education and training for all people in Jamaica in order to foster individual and national development. The MOEYI is in charge of the legislative framework, national policies, strategies, plans, and resources to enable schools, specialized agencies and other bodies to achieve their agreed mandates. The MOEYI is guided by the Philosophy *"Every Child Can Learn, Every Child Must Learn"*, a Vision, *"A customer-centered, performance oriented education system producing globally competitive, socially conscious Jamaican citizens"* and a Mission, *"to provide strategic leadership and policy direction for quality education for all Jamaicans to maximize their potential, contribute to national development and compete effectively in the global economy"*, as it pursues its developmental goals for the nation.

Reforms in Education Sector

Throughout the 1960s, Jamaica built its current educational framework by implementing two important pieces of legislation. The first was the Education Act of 1965, which divided public education into four stages: early childhood (pre-school), primary, secondary, and tertiary. The New Deal for Education was enacted a year later, guaranteeing all children access to primary-level schools.

Jamaica has made substantial progress in education delivery over the past four decades, achieving universal gross enrollment of students from early childhood through the primary levels up to grade nine. Despite these major achievements, the country has faced difficulties in raising standards and improving

9 This study was carried out in 2019. Since then the Ministry of Education, Youth and Information (MOEYI) has changed to the Ministry of Education and Youth (MOEY). The findings and recommendations remain relevant.

the quality of education. Major challenges have included sector governance, shortcomings in teaching and learning quality, equitable access, and enrollment at the higher levels of the secondary system.

Recognizing the importance of an improved public service delivery system in achieving Jamaica's national development goals, Jamaica launched an ambitious Education System Transformation Programme (ESTP). The initiative aimed to increase accountability throughout the system, devolve decision-making authority to the regional level, increase the capacity of teachers and administrators, and provide more targeted support to schools. In addition to the implementation of a decentralized accountability framework, the cornerstone of the ESTP was a restructured Ministry of Education, supported by six newly established independent agencies accountable for results, quality assurance, service delivery, and monitoring of reforms. The agencies are: Central Ministry, Department of School Services (DSS), Jamaica Teaching Council (JTC), National Council for Education Leadership (NCEL), National Education Inspection (NEI) and the National Education Trust (NET).

Education System Overview[10]

Formal education is provided mainly by the government solely or in partnership with churches or private trusts. Both public and private schools exist at all four levels of education. Jamaica operates on a 6-3-2 formal education structure: Primary school has an official entry age of six and a duration of six grades. Secondary school is divided into two cycles: lower secondary consists of grades 7-9, and upper secondary consists of grades 10-11. In principle, primary and lower secondary school are compulsory and free. For primary to post-secondary education, the academic year begins in September and ends in June.

10 Content of this section was compiled from the following sources:

-Education Policy and Data Center. 2014. "Jamaica." Washington, D.C.: Education Policy and Data Center. https://www.epdc.org/country/jamaica.

-UNESCO Institute of Statistics. "Jamaica." Montreal, Quebec: United Nations Educational, Scientific, and Cultural Organization. http://uis.unesco.org/country/JM.

-Kristen Zernick. 2018. "Education System of Jamaica". NAFSA IEM Spotlight Newsletter, Vol. 16, September 2018. https://www.nafsa.org/Professional_Resources/Browse_by_Interest/International_Students_and_Scholars/Network_Resources/International_Enrollment_Management/Educational_System_of_Jamaica/.

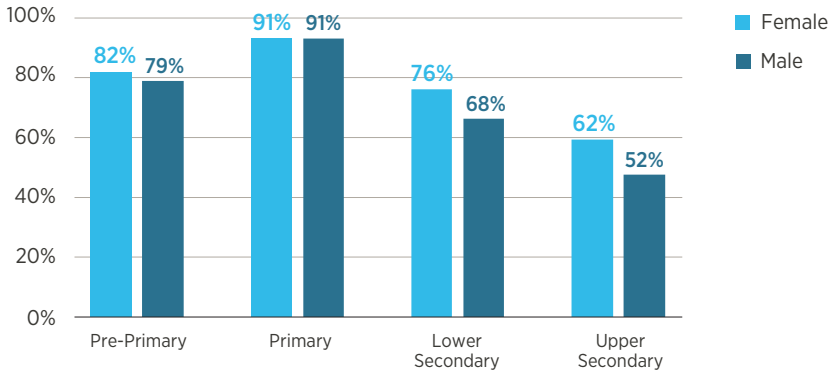
-MOEYI (2018), Education Statistics 2017-2018.

TABLE 4.1.1: **EDUCATION SYSTEM STRUCTURE**

LEVEL	GRADES	ENTRANCE AGE	STATUS
Early Childhood	-	3	Optional
Primary	1-6	6	Mandatory
Lower Secondary	7-9	12	Mandatory
Upper Secondary	10-11[11]	15	Optional
Tertiary	12-13	17+	Optional

Source: UNESCO Institute for Statistics - UIS (2017).

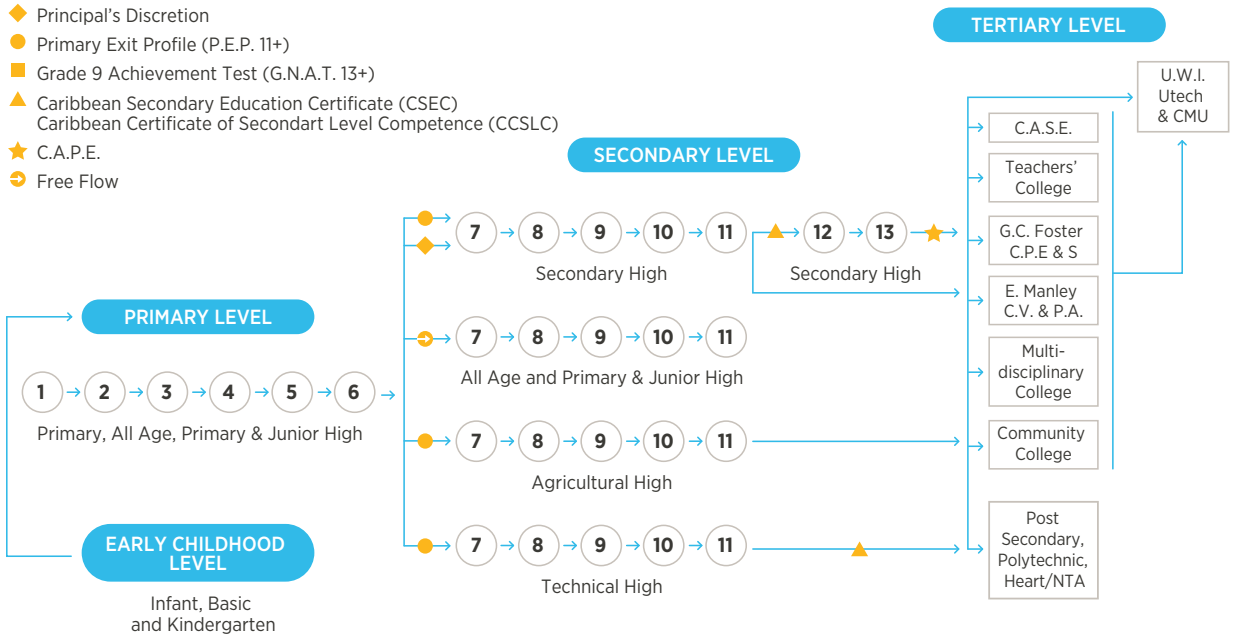
FIGURE 4.1.1: **NET ENROLLMENT RATE, BY LEVEL AND GENDER**



Source: UNESCO Institute for Statistics - UIS (2017).

11 Following grade 11, some high schools offer continuing education programs (grades 12 and 13) through the Career Advancement Programme and the Sixth Form/Pre-university Programme.

FIGURE 4.1.2: **FORMAL PUBLIC EDUCATION SYSTEM FLOW CHART**



Source: MOEYI Education Statistics 2017-2018 (2018).

Early Childhood Level

Early childhood education, also known as preschool, is a non-compulsory level of education offered in both public and private institutions for children aged 3 to 5 years.

With regard to public education, early childhood education is provided in infant schools and in infant departments of some of the country's primary-level schools. The nursery and kindergarten departments of independent preparatory schools (private primary schools) also accept students at the age of 3. In addition, there are a number of community-operated basic schools. These cater for the largest number of students at this level. Basic schools meeting certain minimum requirements are eligible for government grants and are called recognized basic schools.

The sub-sector consists of approximately 1,700 institutions, with 101,000 students enrolled in 2018.

Primary Level

Primary education, both compulsory and free, ranges from 6 to 11 years. Primary education is provided from grades 1 to 6 by more than 900 institutions such as primary schools, primary and junior high schools (mixed) and all-age schools. It is also offered in preparatory schools from grades 1 to 6. In 2018, around 236,000 students were enrolled in primary education.

At the end of grade 6, Jamaican students have taken the Sixth Grade Standardized Examination (GSAT) to determine their admission to secondary schools. GSAT is now being replaced by the Primary Exit Profile (PEP), which focuses on critical thinking and knowledge translation to solve problems. Starting in 2019, this test will also be used to determine the placement of grade 6 students in secondary school. This test is considered more comprehensive for determining students' academic abilities and critical thinking, as it consists of a performance test, an ability test and a curriculum-based test.

Secondary Level

Secondary education is delivered by more than 200 institutions, mostly public. Secondary school is also free, but not compulsory.

Seventy-four per cent of Jamaican students transitioned to secondary education in 2016 (UNESCO 2016), which represents around 210,000 students enrolled in all secondary grades (as of 2017-2018). Divided into two pathways, the secondary level is designed to give Jamaican students the choice between continuous school learning and vocational training. Regardless of their academic background, career-oriented development is an important part of the educational experience for Jamaican students. The Work Experience Program (WEP) and the Community Service Program (CSP) are used to promote practical training and volunteerism at this level.

Grade 11 ends with the Caribbean Secondary Education Certificate (CSEC) exam offered by the Caribbean Examinations Council (CXC). The CSEC includes measures of general and technical competence to determine whether a student is ready for entry-level employment or post-secondary education. Jamaican students completing grades 12 and 13 can take the Caribbean Advanced Proficiency Examination (CAPE). The CXC administers this exam to students who wish to continue their studies at the university level.

Tertiary Level

As an historical tertiary regional hub hosting one of the four campuses of the prestigious University of West Indies, Jamaica has 17 higher education institutions , many of which are founded and managed by foreign institutions.[12]The University Council of Jamaica is responsible for accrediting public and private institutions, including cross-border higher education. Addressing access and equity issues is a priority for Jamaica in the coming years.

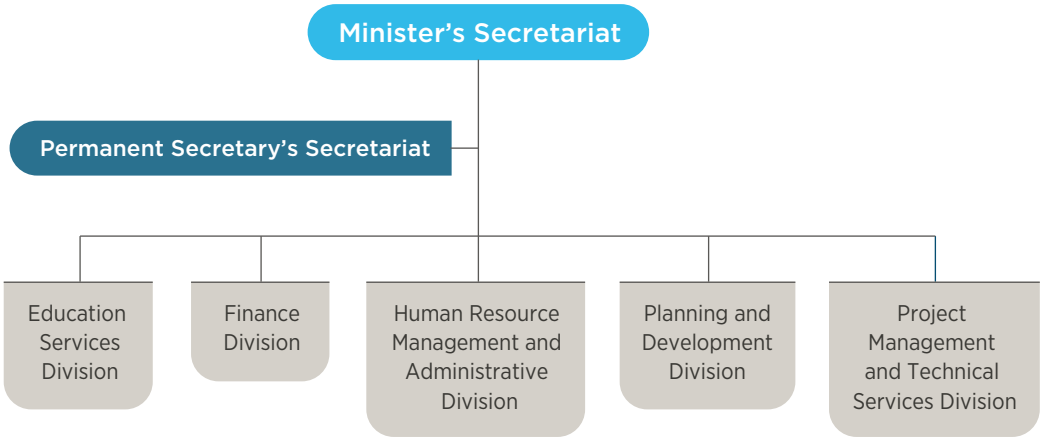
12 Higher education institutions consist of Community Colleges, Teacher Colleges, Colleges of Arts, Sports and Agriculture, as well as Universities.

MOEYI[13] Organizational Structure

The Ministry is headed by the Minister of Education who has the ultimate policy responsibility and authority for the development of education for the Jamaican citizens. Assisting and reporting directly to the Minister is the Permanent Secretary who is the accountable officer with responsibility for the daily operations of the Ministry in carrying out its mandate. The Permanent Secretary is supported by a Chief Education Officer (CEO) and several Divisional Heads.

The organizational chart below outlines the structure of the Ministry of Education:

FIGURE 4.1.3: **MOEYI ORGANIZATIONAL CHART**



Source: own elaboration.

The **Permanent Secretary's Secretariat** consists of the following units: *Communications Unit, Management Information Systems Unit, Documentation, Information & Access Services Unit, Internal Audit Unit, Corporate Planning Unit, Legal Services Unit and Executive Services Division.*

The **Educational Services Division** provides educational support to all education institutions in order to ensure the proper management and administration of Jamaica's education system. It includes a *Curriculum and Support Service Section* in charge of the management of the curriculum for primary and secondary levels, as well as a *School Operations Section* which oversees the supervision and quality assurance of all public Early Childhood, Primary and Secondary schools. The Division is also responsible for the management and administration of the six regional offices of the Ministry. It includes the following units: *Core Curriculum Unit, Guidance and Counselling Unit, Independent Schools Unit, Media Services Unit, Special Education Unit, Student Assessment Unit, Technical and Vocational Unit, Tertiary Unit.*

13 The current MOEY follows the same organizational structure.

The **Finance Division** provides financial and accounting services to support the Ministry. The Division provides guidance for all public schools, MOEYI agencies and the Regional Offices, and manages the funds provided in the Estimates of Expenditure. The unit is also responsible for managing the financing of the Ministry's projects. The units in this Division include: *Accounts Unit, Budget Unit, Final Accounts Unit, Project Finance Unit and the Teachers' Financial Services Unit.*

The **Human Resource Management and Administration Division** has as its responsibility the systematic and coherent management and administration of the Ministry of Education's personnel. It embeds units such as the *Facilities Management Unit, Information Management Unit, Industrial Relations Unit, Personnel Unit, Professional Development Unit and Schools Personnel and Administrative Services Unit.*

The **Planning and Development Division** is responsible for the formulation and integration of educational policies, educational plans, programmes and projects. The Division also evaluates the performance of the Ministry's projects and programmes in relation to the educational goals and coordinates its activities with respect to multilateral and bilateral technical cooperation. The Division has under its portfolio the Educational Planning, Programme Monitoring and Evaluation, Policy Analysis Research and Statistics Units and the International Affairs Desk. The units in this Division are: *Corporate Planning Unit, Educational Planning Unit, Policy Analysis, Research and Statistics Unit, Programme Monitoring and Evaluation and International Affairs Desk.*

Finally, the **Project Management and Technical Services Division** is in charge of project management and technical services required for efficient and effective implementation of Capital Investment Projects. These projects are mostly funded through the MOEYI's capital budget, but some are also directly funded through grants and donations provided by bilateral and international agencies, as well as local companies. The division supervises the construction, extension and furnishing of public education institutions. The units in this division are: *Procurement Unit, Project Management Unit, Technical Services Unit.*

The MOEYI also relies on its specialized agencies for the delivery of education services, all of which were created in the context of the recent education sector reform, the ESTP. They include:

- **Jamaica Teaching Council** (JTC): The JTC is mandated to raise the status and profile of the teaching profession and ensure the provision of professional leadership for teachers. It is responsible for maintaining and enhancing professional standards, regulating, registering and licensing teaching professionals. Its mandate also includes the provision of strategic direction and advice on training and teacher supply and distribution in the public system.

- **National College for Education Leadership** (NCEL): The NCEL is mandated to provide leadership training through the design and implementation of a professional development programme that will provide inter alia, exposure to the Ministry's policies and programmes.

- **National Education Inspectorate** (NEI): The NEI is mandated to inspect and assess school facilities and operations to ensure the effective delivery of education in the public schooling system.

- **National Education Trust** (NET): The NET is the executing agency for GOJ's strategic objectives in enabling and maintaining investments in education. It is intended to mobilize and manage an education endowment fund as a credible and accountable institution responsible for the effective coordination of philanthropy in the education sector and the efficient use of donated resources.

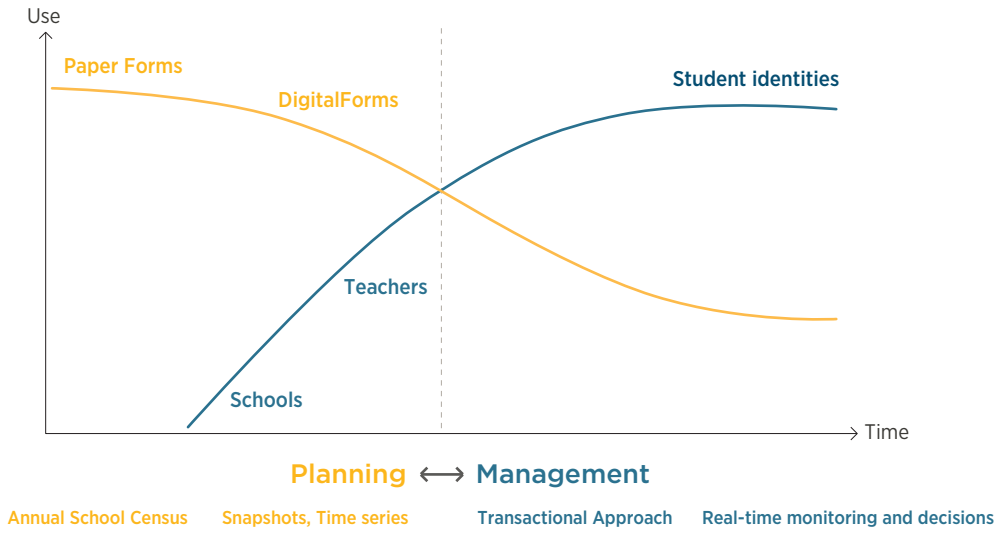
4.2 General Description of the EMIS

The EMIS of Jamaica is characterized by the implementation of a significant number of computer applications which are not integrated and generally do not cover all the demand for information and management of central and regional administration, nor the information needs of schools.

Among the most relevant applications related to the observed processes, the Annual School Census Application (SCA), the National Student Registration System (NSRS), the Enterprise School Management System (ESMS) as well as Orange HR and the Government Finance Management Information System (GFMIS) stand out.

The patchwork of applications contributing to the Jamaican EMIS is a common situation in many countries transitioning from a census based EMIS to a fully transactional system linked to business workflows and operations carried out by education stakeholders at all levels (see figure 4.2.1). Such high impact EMIS requires availability of detailed and real time information recorded in day-to-day operations.

FIGURE 4.2.1: **EMIS TRANSITION IN JAMAICA**



Source: own elaboration.

The Annual School Census is currently the main source of statistical information for the MOEYI and still continues to play a cornerstone role in the Jamaican EMIS. The census is administered every first

Monday of October through paper questionnaires sent to all primary and secondary schools. The questionnaire captures basic school characteristics, aggregated information on student enrollments and special needs, on teaching and non-teaching staff characteristics with their assigned grades, physical infrastructure, furniture, facilities, and equipment. Questionnaires are filled out by school principals in coordination with the school personnel by the end of October, verified by clusters of schools through workshops and then submitted to MOEYI regional offices. Questionnaires are designed and printed using OpenText TeleForm, a data capture software relying on scanning technology to digitalize information contained in paper form. However, the MOEYI unit in charge reported that the technology is not used anymore because of a high number of errors found during the digitalization process. As a result, data is entered manually by data operators in a school census application available in each regional office. The application was developed internally using FoxPro technology which is a data-centric programming language now discontinued (latest update was released in 2007). Data entry at the regional level takes up to eight weeks to complete before regional datasets are sent to the central ministry for consolidation and report preparation. A separate census application is used by the Early Childhood Commission to capture information about early childhood institutions.

The National Student Registration System (NSRS) is a web based Php/MySQL application hosted on cloud premises that was initially developed internally in 2013 by the Management Information System Unit for the Student Assessment Unit to manage national student assessments and exams. It contains general descriptive information about every student, with special needs and assessment results for Grades 1, 3, 4, 5 and 6. The NSRS currently contains student records from Grade 1 to Grade 6. New entrants need to fill out a NSRS paper form and submit a birth certificate at the time of registration in school and are then assigned a unique identifier in the NSRS. The MOEYI collaborates with the Registrar's General Department to cross check NSRS student registration data with information available on the birth certificate. The Grade One Individual Learning Profile (GOILP) is then administered to all Grade 1 students as an instrument used to measure students' cognitive, academic and social readiness for primary school. NSRS registration is mandatory for students to later take national exams. The system is also used to record student performance diagnosis in Grade 3, as well as on the Primary Exit Profile (PEP) administered in Grades 4, 5 and 6. The conditional cash transfer program, the Programme of Advancement through Health and Education (PATH), also relies on NSRS data for attributing cash transfers to families complying with PATH requirements. After registration in the NSRS, students are provided with an ID card. The NSRS is considered as the student management system for most public primary schools, where schools can access their student data online. NSRS is expected to scale up to encompass secondary level, starting with Grade 7 in 2019. However, the Management Information System Unit in charge of the system reported that although the system is working, no qualified staff is available to take care of the NSRS maintenance and improvement.

The MOEYI also deployed a separate database to issue the newly released National School Leaving Certificates rolled out in September 2018. The Certificate provides data on the performance of students over their five years of secondary education, taking into consideration their academic achievement, co-curricular participation and behavior.

Schools do not have access to a standardized school management system provided or recommended by the MOEYI and manage their records manually using physical registers and Excel spreadsheets. As a consequence, out of 984 public schools, 15% (145) are relying on commercial school management system solutions to handle their administrative processes (predominantly secondary schools). The main commercial systems found in Jamaica are Renweb and My School Jamaica.

The physical infrastructure and equipment subprocesses are not relying on any digital system and are exclusively based on paper forms and Excel spreadsheets to keep track of records. The annual school census also provides summary statistical information used by this process.

A directory of schools covering the entire sector is maintained by the MOEYI Planning Unit in coordination with other Units in charge of school registration, such as the Early Childhood Commission for pre-primary institutions and the Independent Schools Unit for non-public primary and secondary institutions. A comprehensive directory of institutions is published on the MOEYI website every year.

In relation to the human resources, budget and finance process, the Human Resource Management and Administration Division relies on a customized version of OrangeHRM to manage HR records. The generic commercial system was modified to record staff leave and professional development information as per the MOEYI's specifications. The system also keeps track of the opening and closing of uniquely identified staff positions and assignment of staff records to available positions. All HR processes at the subnational level, such as teacher recruitment by School Boards, are handled through paper forms before being submitted to the central ministry to be reflected in OrangeHR. OrangeHR is not accessible to general staff, but authorized central ministry users can access the system from the intranet. A maintenance contract is in place to ensure continuous availability of the platform for HR management. The JTC also reported that they manage a separate teacher registration database with professional development records. In January 2019, OrangeHR is scheduled to be replaced by another system provided by the Ministry of Finance and Public Services (MOFPS) called MyHR+. MOEYI personnel interviewed, however, reported delays in piloting and implementing of the new system. MyHR+ is part of a larger package of applications deployed in the public administration by the Ministry of Finance to improve information flows across institutions and facilitate central reporting to the MOFPS and monitoring. The Government Finance Management Information System (GFMIS), which was deployed in February 2019 in the MOEYI, is another key component of the MOFPS package that was recently deployed for budgeting, accounting, cash management and financial reporting.

The MOEYI is also deploying a centralized document management solution call Xythos across all MOEYI Divisions and Units to improve tracking, management and storage of documents and reduce usage of paper.

As for the subprocesses related to digital content management for learning and teacher training, a number of tools are implemented without being integrated between them or with other EMIS components.

In 2010, at the request of the Ministry of Science, Energy and Technology (MSET), e-Learning Jamaica Company Limited (e-Ijam) collaborated with the MOEYI along with the Universal Service Fund (USF)

and financial support from USAID to implement the Tablets in Schools (TIS) Project in selected public schools. Under TIS, the Government of Jamaica provided tablets to selected public schools to support learning and teaching. The objective was to serve pre-primary and primary aged students throughout Jamaica as well as the ten (10) teacher colleges, and twenty-two (22) State Care facilities for a total of 1,106 institutions. TIS ended in 2013 and covered all high schools with provision of interactive boards and computer labs.

e-Ijam also included the deployment of a Central Repository of Education Materials (CREM) for Grade 10 and Grade 11 in preparation for the Caribbean Secondary Education Certificate (CSEC). e-Learning Jamaica Virtual Learning Environment is a Moodle based website, enabling students and teachers to log in and access published contents. With the change of syllabus and curriculum introduced by the National Standards Curriculum (NSC), the usage of the website went down. Virtual classrooms were used for testing.

The NSC was introduced in 2016. The full implementation of the NSC started on a phased basis in September 2016 in all public schools at the Grades 1-9 levels. The curriculum was changed to reflect a greater focus on concepts and 21st century skills and competencies.

That is how CREM evolved into the Primary Exit Profile (PEP) website which hosts digital resources pertaining to PEP. It is the groundwork on which the PEP is set and follows the same content. The PEP is the assessment component of the NSC: it is a series of evaluations that reflect the policy shift of the government and the need to track students' progress over time, with emphasis on higher order thinking skills such as problem solving, analysis and synthesis. The PEP is administered to students in Grades 4, 5 and 6. The PEP replaces the Grade Six Achievement Test (GSAT). The PEP will provide a profile of where the student is academically, the student's strengths and weaknesses, and their readiness for grade 7. The PEP will assess students' knowledge in addition to placing increased emphasis on assessing students' communication, critical thinking and creativity skills.

The CXC also established a website based on NotesMaster where teachers can upload thematic learning content, which is then accessible to students.

Other available learning platforms include:

- Book fusion: enables visitors to purchase E-books (regional portal);

- Learning Hub: for PEP students. EduFocal partnered with the MOEYI to provide online contents. EduFocal is an online social learning community. The company is focused on using technology to enrich the learning experience outside of the classroom as well as to help ideate and innovate the way we move forward with technology in education. Access to content requires registration and fees payment (JMD 2500/day);

- LaSierra was deployed in December 2018 in all secondary public schools. It is an e-library service for secondary students. Schools were provided with a USB stick with contents developed by the US-based La Sierra University;

- MOEYI YouTube Channel.

An E-content committee was established in the Media Service Unit to review and approve electronic contents which could be procured by the MOEYI. The committee consists of curriculum specialists. Private publishers and individuals can propose contents for online publication. Interviews with MOEYI personnel highlighted the need for a systematic evaluation of the impact of those services on student learning outcomes.

A new LMS platform is now under preparation in collaboration with E-Learning Jamaica Company Limited (e-ljam), focusing on developing online learning materials for difficult subjects such as sciences. The first lesson prototype was developed for physics. The new platform is expected to be released in September 2019.

In 2015, the MOEYI developed a functional and technical requirement document to establish a core EMIS application capable of integrating some of the systems described above. The foreseen core EMIS solution is formed by three complementary applications enabling EMIS users in levels ranging from schools to central ministry level to interact with the various modules of the system based on their roles and responsibilities:

(i) School Management System (SMS): a suite of modules to provide support for the following integrated functionalities:

a. School Information System
b. Timetable Management
c. Admission and Registration
d. Student Information Management
e. Fee Management
f. School Outreach Services
g. Facilities Management
h. School Staff Support Services
i. Reporting
j. Systems Integration

(ii) Learning Management System (LMS)

(iii) Learning Content Management System (LCMS)

As a response to the EMIS functional and technical requirements, the MOEYI engaged in an in-house development of an Enterprise School Management System (ESMS) in 2015. The ESMS was seen as

a system that could progressively integrate all the above-mentioned systems. Development of the technical solution started in consultation with UNESCO with funding from the Office of the Prime Minister (OPM). Its design was based on Renweb and MySchool, the two main commercial school management systems used in Jamaica, as well as on UNESCO/CSF OpenEMIS Core generic EMIS application. The ESMS online application follows PWC's recommendation for a modular approach to software development: according to the Management Information Systems Unit, new modules and features can be added to capture new information requirements. The ESMS currently contains the following modules: Student directory, student and staff attendance, staff/teacher directory, course management, critical incidents. A school dashboard provides a summary view of each school's records. The MOEYI plans to migrate the data from NSRS to ESMS. The ESMS could record students' National Identification Number (NID) when the National Identification System (NIDS) is rolled out nationwide by the Jamaican Government. The ESMS will also capture student results/marks in school.

The ESMS software development is coordinated by the Management Information Systems Unit attached to the Permanent Secretary's Secretariat. Due to scarcity of funds and unavailability of a sufficient number of qualified programmers, the system is still at development stage three years after it was created. JM$900,000 were spent for the current version of the system while a figure of several millions was mentioned during interviews to develop the target system. The MOEYI reported that it had obtained US$250,000 in funding from the PM's Office and was seeking an additional US$250,000 more to finalize the system. No documentation could be shared to assess the accuracy of those numbers. Presently, the MOEYI does not have a team in place to develop, support and update the system.

The ESMS is not yet rolled out nor piloted in Jamaican schools as the system needs more work. A roadmap for its implementation is in preparation but no documentation could be shared. The MOEYI plans to start a progressive deployment of the ESMS in all schools (2-year plan) in 2019 and to use the ESMS to assist the piloting of the NIDS in 2020 by the Jamaican Government.[14]

Table 4.2.1 details the main applications reported by the MOEYI. This diagram also details the main processes and structural conditions of the EMIS that are related to each of these applications. It should be noted that the diagram only lists the most relevant systems.

14 As in the rest of the analysis, this refers to 2019 information.

TABLE 4.2.1: **MAIN APPLICATIONS AND THEIR RELATIONSHIP WITH EMIS PROCESSES**

MAIN APPLICATIONS AND THEIR RELATIONSHIP WITH EMIS PROCESSES	PROCESSES						STRUCTURAL CONDITIONS	
	Phisical Inf. & Equipments	Schools	HR, Budget & Finance	Students & Learning	Digital Contents	Strategic Planning	Technological infrastructure	Governance & Institutional Framework
NATIONAL STUDENT REGISTRATION SYSTEM (NSRS)				●				
ANNUAL SCHOOL CENSUS APPLICATION (SCA)	●	●	●	●		●		
ENTERPRISE SCHOOL MANAGEMENT SYSTEM (ESMS)	●	●	●	●		●		
MONITORING AND MANAGEMENT INFORMATION SYSTEM (MMIS)		●		●				
NATIONAL SCHOOL LEAVING CERTIFICATE (NSLC) DATABASE				●				
RENWEB		●						
MY SCHOOL		●						
NATIONAL EDUCATION INSPECTORATE DATABASE (NEI)		●						
ORANGE HR M			●					
MyHR PLUS			●					
BASEPAY			●					
FINANCE MANAGEMENT INFORMATION SYSTEM (GFMIS)			●					
JTC TEACHER REGISTRATION DATABASE			●		●			
PRIMARY EXIT PROFILE WEBSITE (PEP)					●			
BOOK FUSION					●			
LEARNING HUB ONLINE					●			
EDUFOCAL				●	●			
GOOGLE SUITE	●							
TEXTBOOK MANAGEMENT SYSTEM	●							
NATIONAL EDUCATION TRUST EDUCATIONAL NEEDS DATABASE	●							
XYTHOS ON DEMAND (XOD)							●	
MICROSOFT ACTIVE DIRECTORY							●	

Source: own elaboration.

NAME	DESCRIPTION	PROCESSES AND STRUCTURAL CONDITIONS OF EMIS TO WHICH THE SYSTEM IS RELATED
NATIONAL STUDENT REGISTRATION SYSTEM (NSRS)	Application recording student information from Grade 1 to Grade 6 (to be progressively extended to Secondary grades starting from 2019). Information is mainly used by the Student Assessment Unit	**Process** 4-Students and Learning
ANNUAL SCHOOL CENSUS APPLICATION (SCA)	Teleform (ORM) / FoxPro application used by the Planning and Development Division to administer yearly school census questionnaires to schools	**Processes** 1-Physical Infrastructure and Equipment 2-Schools 3-Human Resources, Budget and Finance 4-Students and Learning 6-Tools for strategic Management
MONITORING AND MANAGEMENT INFORMATION SYSTEM (MMIS)	Application used mainly by the School Feeding Unit to monitor implementation of the conditional cash transfer Programme of Advancement through Health and Education (PATH). The system was recently discontinued.	**Processes** 2-Schools 4-Students and Learning
XYTHOS ON DEMAND (XOD)	Centralized document management solution under deployment across MOEYI Divisions and Units	**Structural Condition** 1-Technological Infrastructure
ORANGE HRM	Human Resource Management application used by the MOEYI Human Resource Management and Administration Division to manage teaching and non-teaching staff records	**Process** 3-Human Resources, Budget and Finance
MYHR PLUS	Official public sector Human Resource Management application deployed by Ministry of Finance and currently piloted by MOEYI	**Process** 3-Human Resources, Budget and Finance
TEXTBOOK MANAGEMENT SYSTEM	Application used by the Media Services Unit to manage textbook distribution to public schools	**Process** 1-Physical Infrastructure and Equipment
RENWEB	School Information System (SIS) commonly used by private schools in Jamaica	**Process** 2-Schools
MY SCHOOL	School Information System (SIS) commonly used by private schools in Jamaica	**Process** 2-Schools
ENTERPRISE SCHOOL MANAGEMENT SYSTEM (ESMS)	New Education Management Information System (EMIS) currently developed by MOEYI for school records management	**Processes** 1-Physical Infrastructure and Equipment 2-Schools 3-Human Resources, Budget and Finance 4-Students and Learning 6-Tools for strategic Management

NAME	DESCRIPTION	PROCESSES AND STRUCTURAL CONDITIONS OF EMIS TO WHICH THE SYSTEM IS RELATED
JTC TEACHER REGISTRATION DATABASE	Application used by the Jamaica Teaching Council (JTC) to manage public and private sector teachers' registration as well as professional development records	Processes 3-Human Resources, Budget and Finance 5-Digital Content and Teacher Training
NATIONAL EDUCATION INSPECTORATE DATABASE (NEI)	Application used for the management of school inspections by the National Education Inspectorate (NEI)	**Process** 2-Schools
PRIMARY EXIT PROFILE WEBSITE (PEP)	Online application offering training materials and learning resources for students	**Process** 5-Digital Content and Teacher Training
BOOK FUSION	MOEYI online library application offering Digital content (ebooks) to students	**Process** 5-Digital Content and Teacher Training
LEARNING HUB ONLINE	Online portal offering access to PEP, CPEA, CSEP and CAPE materials for students and for teachers	**Process** 5-Digital Content and Teacher Training
BASEPAY	Payroll system provided by the MOFPS	**Process** 3-Human Resources, Budget and Finance
FINANCE MANAGEMENT INFORMATION SYSTEM (GFMIS)	The public sector budgeting and accounting platform. System was recently deployed (Feb 2019)	**Process** 3-Human Resources, Budget and Finance
GOOGLE SUITE	MOEYI uses Google services for Emails	**Structural Condition** 1-Technological Infrastructure
MICROSOFT ACTIVE DIRECTORY	Used to manage user accounts in central MOEYI. Some information systems such as Xythos use active directory for login	**Structural Condition** 1-Technological Infrastructure
NATIONAL EDUCATION TRUST EDUCATIONAL NEEDS DATABASE	Enables schools to record infrastructure and equipment needs and allows donors/partners to finance	**Process** 1-Physical Infrastructure and Equipment
NATIONAL SCHOOL LEAVING CERTIFICATE (NSLC) DATABASE	Indicates the extent to which students have attained the required competencies at the end of secondary education. It documents the knowledge, skills and attitudes developed by each student over the entirety of their secondary schooling (Grades 7-13)	Process 4-Students and Learning

In terms of technological infrastructure, the MOEYI was able to set up quality computer and network infrastructures for its central and regional administration. MOEYI Units are equipped with sufficient numbers of computers, with recurrent budget for regular upgrades. Intranet and internet connectivity are also satisfactory.

At the school level, the situation is more nuanced. Most schools are connected to the internet through contracts with telecom operators. Public schools use their own budget to purchase connectivity plans.

In terms of governance and institutional framework, the MOEYI operates under the umbrella of the Constitution of the Government of Jamaica which guarantees access to education to every child. Specific regulatory tools for the education sector include the Education Act (1965) and the Education Regulation (1980), from which the MOEYI develops specific policies. An ICT in Education policy was elaborated in 2018 with support from UNESCO.

5 MANAGEMENT PROCESSES

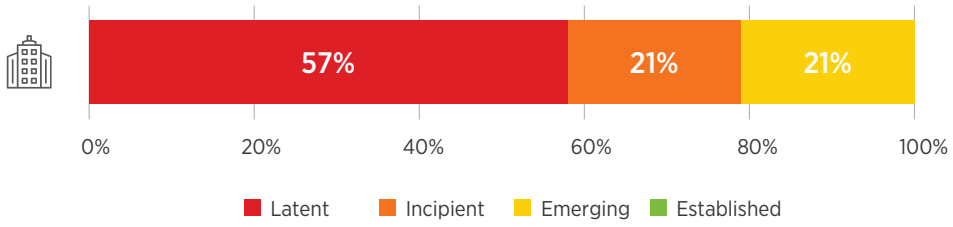
5.1 Process 1: Management of Physical Infrastructure and Equipment

Main information systems supporting this management process:

> School Census Application
> Excel Datasheets

Diagnosis: This process is at a Latent stage of development (1). Figure 5.1.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 5.1.1: **LEVEL OF DEVELOPMENT OF THE PHYSICAL INFRASTRUCTURE AND EQUIPMENT SUBPROCESSES**



Source: own elaboration.

Strengths

The school census is the main source of information and provides annual statistical information about the number and condition of buildings. Through the annual census, the MOEYI is able to capture basic information about available buildings, school infrastructure and equipment.

The information available on physical infrastructure, although limited, is used by MOEYI's Planning and Development Division to map the school and measure the adequacy between the supply of physical infrastructure and the demand for educational services.

Challenges

The MOEYI is not yet attributing a unique identifier to school buildings which could be used in other EMIS processes. The school, as an administrative entity, is the lowest unit for which a unique code is implemented. Moreover, georeferencing is done for schools, not for buildings that comprise it. As a consequence, the MOEYI does not have a registry of uniquely identified buildings which could be used as a reference to keep track of the construction/repair needs and conducted/ongoing/planned interventions.

Decentralization policies with transfer of responsibilities to School Boards is another challenge. Below a certain threshold, schools undertake repair work using their own budget without systematically informing central administration or keeping track of the interventions in a centralized register. Above a certain amount, and after being approved by the school Board, maintenance requests are submitted to their respective regional offices on paper forms, which in turn forward the information to the central level. Processing times are reported to be long. Interviewed school personnel reported that some requests that were considered urgent for them sometimes took one to two years before being processed. Having systematized processes that provide traceability of the funds used by the school and the interventions made would allow the MOEYI to have real-time information on the state of its buildings.

Overall, physical infrastructure and equipment management is not computerized. All maintenance processes are handled through paper forms.

The information about the use and occupancy of the buildings by classes, teachers and students is not recorded and classrooms are not linked to buildings but simply counted at the level of the school. As a consequence, it is not possible to know in which building a given school shift takes place, nor to precisely calculate occupancy rates.

The state of conservation of the buildings is captured by the Annual School Census questionnaire which classifies buildings in three categories (in good condition, needing minor repairs, needing major repairs). However, there are no clear instructions on how to classify buildings. Given that this information is captured by school personnel who are not professionally skilled to assess the needs, data is often recorded subjectively by school personnel, leading to poor quality of the information captured by the census.

While rules and regulations stipulate that regional officers should normally conduct a visit to each school in their area at least every five years to assess building/infrastructure maintenance needs, this information is not recorded in the EMIS. Emergency needs are also managed in an ad-hoc manner and interventions are not systematically recorded in any system except in dispersed Excel sheets.

The MOEYI is not implementing a centralized repository of assets and equipment such as laboratories, libraries, canteen, computers, etc. Again, the Annual School Census is the only source of information where main equipment, furniture and educational facilities are counted at the school level.

Overall, the MOEYI is not able to maintain accurate and real-time information on buildings and equipment in a single register, thus restricting relevant staff in charge of maintenance and procurement from accessing information for decision-making, whether at the school, regional office or central ministry level.

Articulation

Given the lack of centralized digitalized systems and protocols, shortcomings in terms of the 'recording and maintenance of data as part of this process are problematic not only for the proper monitoring and management of school infrastructure, but also for the other processes in this study. The situation impacts the responsiveness of the Ministry to deal with urgent needs as well as to plan longer-term needs or simply monitor maintenance operations. A set of indicators useful for system management, such as shift occupancy rates, cannot be calculated appropriately.

Recommendations

It is recommended to set up a single register of school buildings from which all the elements necessary for their management are linked. The register should assign a unique identifier to all buildings and rooms and then record associated data such as geo-referencing, measurement as well as inventory of all movable and immovable properties available, specifying their source of supply.

The inventory of infrastructures, as well as the evaluation of their condition, should first be carried out by qualified experts able to objectively assess the situation based on professional criteria[15]. Once baseline data is available, workflows should be established with defined roles and responsibilities for updating records and adding new ones. For example, new construction or extensions of new buildings managed by the Project Management and Technical Services Division would be recorded and approved directly in the system. Reference to documentation such as plan, procurement process and contracts could be attached for transparency purpose and for record archiving. In that regard, integration with the Xythos document management system is recommended.

The information could also be updated during planned maintenance visits. It is also possible to rely on school staff to count the available equipment and record it in the register. Asset management and records should be managed at the school level. Schools should have the ability to maintain their records in a central system which can be used by the MOEYI to track the status of school infrastructure. All this information could later be used to precisely track assignment of classes to rooms.

It is also recommended to link the following modules to the register:

- School Maintenance Visits: This module would enable the Project Management and Technical Services Division to keep track of the status of maintenance visits and ensure appropriate and regular coverage of the network of schools.

15 The Ministry of Education and World Bank Jamaica Safe Schools Project: School Inspection Programme (JSSP) is a first attempt to build such a repository. Under the JSSP project, 971 public infant, primary and secondary schools across Jamaica have been inspected since 2017 to assess the risk, structural and functional needs. These assessments will enable the Government of Jamaica to prioritize investment plans to build infrastructure resilience in these schools. The JSSP, however, is not yet covering all schools in Jamaica.

- Maintenance Requests: This module would enable school principals to submit maintenance requests to the MOEYI. Comments and attachments would enable users to precisely document the needs. Requests should be processed through workflows, enabling various levels/personnel to approve, reject or re-prioritize requests.

- Management of Interventions: This module would complement the previous ones to keep track of maintenance interventions linked to previously created requests. Scope of work, contracting company, status of implementation, execution time and amount is a minimal set of information to record in order to enable the MOEYI to precisely monitor status of the activities, progress of the work and identify any gap that may arise.

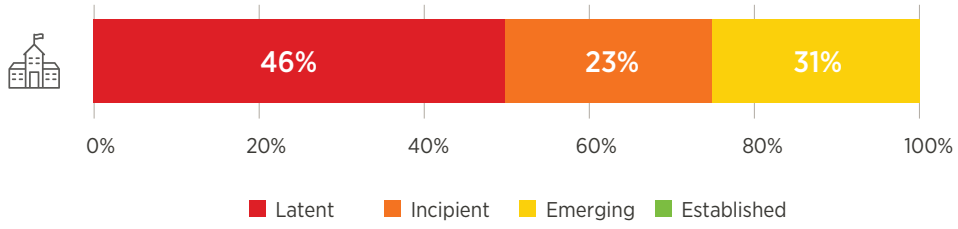
5.2 Process 2: Management of Schools

Main information systems supporting this management process:

> Annual School Census Application
> ESMS (Pilot stage)
> Renweb / My School Jamaica (in private institutions)

Diagnosis: This process is at an Incipient stage of development (2). Figure 5.2.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 5.2.1: **LEVEL OF DEVELOPMENT OF THE EDUCATIONAL INSTITUTIONS SUBPROCESSES**



Source: own elaboration.

Strengths

There is availability of a well-constructed unique identifier for schools. The MOEYI's Planning Unit attributes a unique identifier to all primary, secondary and tertiary schools. The code consists of 5 digits: 2 digits for the Parish and 3 sequential numbers (1 digit distinguishes private from public institutions). When a school is closed, its school code is locked to prevent historical code duplication. The Early Childhood Commission (ECC) is in charge of infant school registration. It assigns a unique

ID to infant schools. The ECC uses its own unique identifier which sometimes overlaps with the code numbers assigned by the MOEYI (e.g. for a school with an infant programme).

The school's unique identifier is used as a reference number for all MOEYI units and across the various systems that make up the EMIS.

The Annual School Census is administered every year in a timely manner and provides recurrent statistics to the MOEYI which are used for planning, management and monitoring of the sector.

The MOEYI has a vision for the establishment of a comprehensive information system able to keep track of school information in real time and that can be used to inform day-to-day management needs at all administrative levels including at the school level. The MOEYI started development of a web-based platform called ESMS. The system is developed internally and is at the pilot stage. In 2019, the MOEYI also is piloting deployment of a commercial School Management System (MySchool) in 300 public schools to see to what extent such a solution could address the management needs of schools as well as the reporting needs of the MOEYI.

Challenges

The main challenge found under this process is that there is presently no single system to store and maintain information about schools that is capable of informing decisions at all administrative levels, including at the school level.

The ESMS application is not yet ready and suffers from delays in its implementation, mainly due to the unavailability of sufficient funding for the recruitment of qualified staff to develop and maintain the required system features. The timeline for ESMS deployment is unrealistic given the current maturity of the system. The MOEYI envisions rolling out the system in all schools in 2019, although not all software application modules are available yet, nor fully developed. Moreover, the ESMS is not yet tested.

The annual school census is presently the main system used to keep track of school information. The annual school census system is not serving school management needs but is solely designed to serve the MOEYI planning and management needs. Schools are generally not getting feedback on data they submit and are unable to access information on their performance. The only feedback received is the National Exam Report, which takes five months to produce. Schools are seeking more feedback on how they perform and how they could improve their operations.

Moreover, the coverage of the private sector remains an issue, especially at the pre-primary level where the largest share of private institutions is found.

While annual census workflows for data collection were established to ease digitalization of the information collected manually by schools, those could not be sustained. This is notably the case for the scanning technology used to digitalize the paper questionnaires filled by schools. The process was found to generate many errors when reading the questionnaires, leading to discrepancies in recorded

information and poor data quality. As a result, this technology is not used anymore. Instead questionnaires are manually digitalized by data operators in regional offices, which drastically increases the time required to process the data (it takes 8 weeks for REOs to digitalize the census questionnaires).

Fragmented school management systems exist at the school level (when they are available), making data integration more challenging. Commercial systems are relatively costly for schools and only found in large institutions with enough resources. Of the 984 public schools, 145 are using privately run systems for administrative processes (predominantly secondary schools).

Articulation

Decentralization policies require the establishment of school-level management information systems to support schools in their day-to-day operations and to foster stakeholder's accountability. At present, such a system is not in place, leading to important administrative burden in schools and increasing the complexity of their daily management. Likewise, information currently available for the MOEYI to manage schools remains limited and exclusively consists of statistical figures provided by the annual school census.

Recommendations

Establish and maintain an online sector-wide directory of uniquely identified schools. The directory should keep track of all changes occurring on record. It should contain a record for all institutions, including for those that were closed. The recording of an institution's opening and closing dates would notably allow users to retrieve a list of schools at any point in time, whether for the current date (showing a list of institutions as of now) or a date in the past (showing the list of institutions at a specific date in the past). This directory should become the master repository for identification of institutions and should always be updated first before any other system. All EMIS sub-systems should refer to the institution directory identifiers when recording thematic information.

Given that schools are registered by various entities attached to the MOEYI such as the Early Childhood Commission for pre-primary institutions, the Independent Schools Unit for non-public primary and secondary institutions and the Planning Unit for other institutions, coordination mechanisms and registration workflows across MOEYI registration units should be consolidated. It is recommended to keep the responsibility of the maintenance of the directory to the MOEYI's Planning Unit, which should be the sole entity authorized to attribute a unique number to newly registered institutions. This process could eventually be delegated to the Early Childhood Commission for pre-primary institutions given that it operates separately from MOEYI's central ministry, but in that case, MOEYI's Planning Unit identification standards should be carefully followed, and new records should be validated by the Planning Unit before being published in the directory. The directory could be accessible to the public and could be used by schools to propose updates to their records. For example, after login into the directory, a school should be able to submit a change of phone number or update contact information. Change requests should always be approved by the reference registration entity.

Given that coverage of the private sector is a challenge, it is recommended to strengthen registration and license renewal mechanisms for non-public institutions, notably by conditioning the license issuance and renewal to timely reporting into the EMIS. Linking school resource allocation (and funding) to the provision of accurate data could also ensure better coverage of the sector.

Academic records of each institution should also be kept with tracked changes, allowing users to easily identify schools by their educational offer and other basic characteristics, such as grades, curricula, and offered subjects.

Although the MOEYI is currently implementing policies aimed at closing double-shifted schools, the management of shift information should remain a feature available in the EMIS to ensure data structure remains valid if shifts are re-introduced at a later stage.

Given that schools or shifts could eventually operate in shared physical infrastructure such as buildings, it is recommended to link EMIS school records with the infrastructure and equipment EMIS sub-system.

It is also recommended that the MOEYI maintain a set of normalized core nomenclatures and mapping tables for the classification/categorization of EMIS records. Nomenclatures and mapping tables should be widely shared to ensure interoperability across systems. Priority nomenclatures include lists of administrative/management areas, school classifications by sector/provider/type or education system components such as levels, cycles, education programmes, grades, subjects, and so forth.

A school management system should be accessible to all schools in Jamaica. This tool should enable schools to record information and use it in their day-to-day management and to report to the MOEYI. Provided the ESMS is mature enough, it could be used as the multi-users / multi-level system for school record management by the administration as well as for management of the school by school personnel. Deployment of the ESMS in all schools might, however, be a challenge, notably in the private sector or in large schools where internal School Management Systems are already in place. If the MOEYI wants to continue allowing schools to select their own School Management System (for those schools that can afford it), it should also ensure that the commercial SMS are able to automatically report back into the main ESMS application. This could be done through implementation of data exchange APIs in the ESMS, as well as through the publication of minimum requirements for SMS applications in Jamaica, stipulating the data exchange standard and communication modalities with MOEYI's core system. For example, the Common Education Data Standards (CEDS) is a United States national collaborative effort to develop common data standards for a key set of education data elements to streamline the exchange, comparison, and understanding of data within and across institutions and sub-sectors. SDMX, or Statistical Data and Metadata eXchange, is another example of an international initiative aimed at standardizing and modernizing ("industrializing") the mechanisms and processes for the exchange of statistical data and metadata among international organizations and their member countries. The SDMX is also used at the national level.

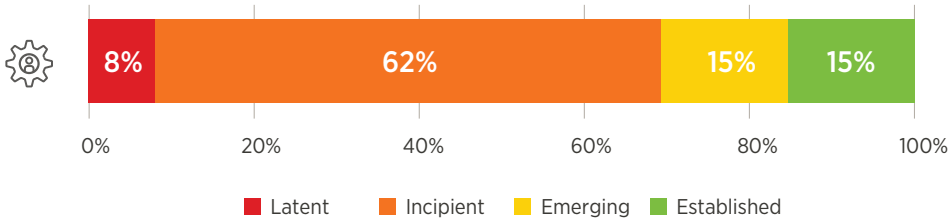
5.3 Process 3: Management of Human and Financial/Budgetary Resources

Main information systems supporting this management process:

> OrangeHR
> MyHR Plus
> BasePay
> Government Financial Management Information System (GFMIS)

Diagnosis: This process is at an Incipient stage of development (2). Figure 5.3.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 5.3.1: **LEVEL OF DEVELOPMENT OF THE HUMAN AND FINANCIAL/BUDGETARY RESOURCES SUBPROCESSES**



Source: own elaboration.

Strengths

The MOEYI has a comprehensive human resource management solution to manage public sector personnel data. All HR resources are uniquely identified based on the Tax Registration Number. The distinction between administrative positions and staff identifiers allows for accurate staff management in public schools.

The Jamaica Teaching Council (JTC) teacher registration database is an attempt to build a comprehensive directory of teaching professionals covering the entire education system, both for public and private sectors. The JTC is the body responsible for regulating the teaching profession, building and maintaining teachers' competencies, raising the public status of teachers and ensuring that policies and guidelines established for the teaching profession are informed by performance. Its regulatory function includes the registration and licensing of teachers. These functions are directly linked to the Code of Ethics governing members of the teaching profession. All Jamaican teachers are required to be registered with the Ministry of Education for eligibility to teach in Jamaica prior to approval of salary payment. An unregistered teacher does not qualify for compensation and would be subject to disciplinary action.

A complete digital record of salary settlements is made by means of the unique personnel identifier (Tax Registration Number - TRN), and the corresponding budget item is identified.

The MOEYI has a systematized process for the budgetary administration of schools that is used throughout the education system. School budgets are allocated at the regional level. Schools keep track of their spending manually, with control from the School Board. Processes are in place for budgetary administration of schools.

The Government Finance Management Information System (GFMIS) managed by the MOFPS is deployed and used by the MOEYI for budgeting and accounting.

Challenges

Human resource data is fragmented and poorly integrated. The empowerment of the JTC as the MOEYI's specialized agency responsible for the national teacher register has led to the emergence of a separate system for teacher registration/licensing and eventually professional development management and monitoring, not integrated with the main HR application used by the MOEYI (OrangeHR). It also leads to partial duplication of information and growing risk of discrepancies between HR subsystems when they scale up if those are not carefully integrated.

Another challenge lies in the foreseen replacement of OrangeHR by a new centralized government system for civil servant management (MyHR+). While this could be seen as an opportunity and even a strength for government as a means to consolidate and harmonize its HR records across public administration, there is also high risk of failure and disruption in HR workflows if the transition is not carefully planned. Again, establishment of a new HR management system such as MyHR+ should be contextualized with other HR related datasets existing inside MOEYI and its specialized agencies, to ensure integration and concordance of thematic records across systems.

Current systems used by the MOEYI to manage staff records still require a great deal of manual work for human resource management: All HR processes at the subnational level, such as teacher recruitment by School Boards, are handled through paper forms circulating from schools to Regional Education Offices (REOs) before reaching the central ministry, where HR staff are in charge of processing the files and recording them into OrangeHR. This situation leads to latency in HR and payment workflows, whereby teachers may continue to be paid for a few additional months under prior conditions despite a change in their situation. The MOEYI is considering the use of the Xythos on demand document management solution as a way to digitalise and improve efficiency of these processes.

Teacher attendance records exist on paper in schools but are not systematically reported to REOs, nor recorded in a centralized system. Only recurrent or long staff leaves involve the preparation of a letter by the principal, submitted to the School Board and then to the REO. Staff attendance/leave processes should be digitalized so that information can be monitored. Staff attendance monitoring is a requirement to measure quality of education delivery.

After a pilot in 2016, revised teacher appraisal mechanisms are being implemented by the JTC as part of its mandate. Appraisal rubrics include knowledge of the subject area they teach, pedagogical approach, classroom management, professional development, stakeholder engagement and professional conduct. Formative appraisals, which review the performance of principals, have been proposed to be carried out by education officers and School Boards every six months. It has been suggested that a summative appraisal of principal performance is to be undertaken every two years. Appraisal instruments are all paper-based and while summary information is sent to the MOEYI, it is not digitalized. Teacher appraisal information should be precisely recorded and tracked and used to propose/recommend training programmes based on needs identified during the appraisal.

In the context of decentralization policies, teacher recruitment has been devolved to School Boards. Positions are locally advertised, and no central tool exists to list all open positions that teachers/staff can apply to. As a consequence, teacher hiring in schools often depends on principal's personal networks. Another challenge is that the position the teacher is recruited for is attached to the school, with no possibility for staff mobility (except staff willingness). The MOEYI is thus unable to match deployment of its workforce with the changing geographic and demographic demands for education.

In terms of budgetary and financial processes, the main challenge encountered by the MOEYI is the high level of centrality of the information systems currently in place. While budgetary allocations are school based, recording of expenses and financial transactions by schools are kept on paper and remain at the school level. Therefore, it is not easy for the MOEYI to compare budgetary allocations of schools with profiles of actual expenditures.

The Government Finance Management Information System (GFMIS) that was recently deployed is only accessible to the central MOEYI. As a consequence, all transactions happening at the sub-national level are recorded on paper or ad-hoc Excel files and submitted to the central MOEYI for recording into the GFMIS. This process generates a significant workload for data entry by finance staff, which prevents them from performing other control or monitoring tasks related to financial and budgetary operations. For example, all payroll calculation processes are externalized to a private company (IBM), while those processes could possibly be handled internally.

Articulation

This process has a central system, OrangeHR, by which the sub-processes of posts and teachers financed by the MOEYI are managed with relative efficiency. Internally, it uses the Tax Registration Number as a unique identifier of these positions, their human resources and the association with the budget and the settlement of the monthly payroll. The OrangeHR system is closed, without being integrated into complementary systems used in this process, nor with the systems used in other EMIS processes. This lack of integration prevents an immediate response to elementary requirements such as the comprehensive view of the teaching file or the information of teachers providing training to a particular student (or group of students). This and other aspects are relevant when monitoring the quality of education in Jamaica. The fact that teacher's registration and professional development

is being progressively managed by the JTC also complicates the situation as this information is not linked to core HR records found in OrangeHR. Deployment of a new HR management system, MyHR+, may further complicate the situation if data integration measures are not in place.

Recommendations

The progressive decentralization of decision-making to lower levels, such as schools being capable of hiring or replacing teachers, requires the deployment of a comprehensive HR management solution enabling all administrative levels to have a comprehensive, precise and real-time view of human resources deployed in schools. An ESMS staff management module or another equivalent tool could be used, provided it includes flexible data validation workflows aligned with HR policies.

A separate HR management system could manage public servant records and salary calculations. Transition from OrangeHR to MyHR+ should be carefully planned to avoid any disruption in HR operations. If not available already, a change management plan should be established to ensure successful migration to the new system and alignment of MOEYI HR workflows with MyHR+ application workflows.

The MOEYI should establish a centralized system to publish open/vacant positions in schools, enabling teachers to have open access to information. Ideally, teachers should be able to apply or express interest online, so that recruitment processes are carried out in a transparent way. Similarly, the Ministry could, through a real-time updated JTC teacher database, maintain a centralized pool of staff profiles that could be eventually recruited by schools.

It is recommended to enable teachers, and education staff in general, to have access to an online portal where they can consult their personal HR records. Ideally, such a portal should grant staff access to a comprehensive set of information, such as all their historical records on employment, payroll, leave and professional development. Such a HR portal should also enable staff to notify MOEYI administration about any change in their personal information, such as change of home address, phone number, etc., and to eventually upload corresponding proof documents. All HR workflows could then be progressively digitalized. This calls for integration of all thematic datasets of teaching and non-teaching staff currently recorded by schools, the JTC, the NEI, and MOEYI's HR department in a single platform storing comprehensive information on the education workforce.

With regard to the recruitment of teachers in public schools, it is recommended to study the feasibility of implementing a mechanism for increased mobility of school staff in order to better manage the distribution of staff in line with changing demand. Among the scenarios envisaged, the MOEYI could consider revising the employment contracts drawn up by public institutions so as to include a mobility clause in nearby institutions.

In terms of budgetary and financial processes, the MOEYI should provide schools with a standardized accounting platform helping them maintain digital budgetary and financial records and enabling MOEYI's administration to precisely monitor school financing and expenditures.

The MOEYI also should consider the digitalization of payment request workflows at the sub-national level to reduce the data entry workload in the central ministry. Decentralizing data entry for payment requests would enable the central Finance Unit to focus on tasks other than processing of paper forms and might lead them to eventually reconsider externalizing payment calculation processes to the private sector. Recruitment of a business analyst could help the MOEYI to more effectively link the EMIS processes with the budgetary and financial processes happening at school, regional and central levels.

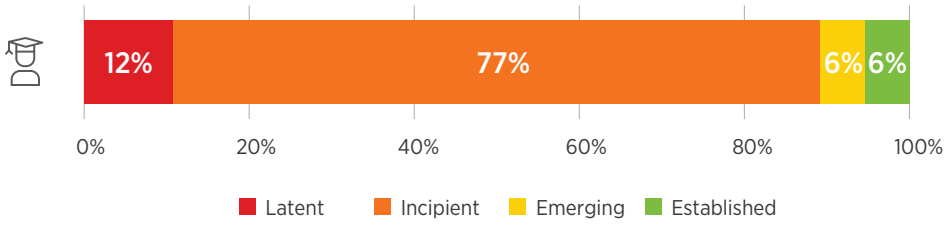
5.4 Process 4: Management of Students and Learning

Main information systems supporting this management process:

> NSRS
> Annual School Census
> ESMS
> Monitoring and Management Information System
> National School Leaving Certificate (NSLC) Database
> RenWeb (or other equivalent student information systems for schools)

Diagnosis: This process is at an Incipient stage of development (2). Figure 5.4.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 5.4.1: **LEVEL OF DEVELOPMENT OF THE STUDENTS AND LEARNING SUBPROCESSES**



Source: own elaboration.

Strengths

The MOEYI has a documented and proven experience for deployment and implementation of a national student management information system (NSRS). Most schools are used to following normalized procedures for student registration and enrolment in school and have a culture of reporting student information into a centralized student information system.

The MOEYI relies on an Annual School Census to collect basic information about student enrolments. This information is used for planning and management within the MOEYI.

The MOEYI implements a comprehensive student learning assessment program through the Grade One Individual Learning Profile (GOILP) and Primary Exit Profile (PEP) components of the National Standards Curriculum (NSC). The program relies on the NSRS to record key results of the student assessments.

Available data on student examinations is used to inform policies. The Planning and Development Division analyzes CXC examination results data to inform policies. The analysis is done at the national level only. Schools have the ability to access the CXC's portal to see their results and compare them with national trends. For national exams, a reporting mechanism is in place, enabling schools to assess how they perform compared to Parish and national averages. The School Feeding Unit also relies on NSRS student data to manage distribution of free meals in the context of the PATH program.

Challenges

The main challenge found under this process is the unavailability of a comprehensive student information system registering all students enrolled in schools. Presently, information is scattered in various information systems that are not connected. The NSRS system is the largest system in terms of number of students registered and scope of student level information captured. It is also the official platform promoted by the MOEYI for student registration. However, the NSRS only covers public primary schools from grades 1 to 7[16].

Not all students have a unique identifier that allows the Ministry of Education to track students' progress through the education system, as this identification system is only partially implemented in the NSRS up to grade 6. Aggregated information about number of students by grade, programs and sections by school is produced on a yearly basis through the school census but this tool does not record nominative information. Commercial School Information Systems used by large schools often contain this information as well, but information is not normalized across schools, preventing the MOEYI from using and consolidating it in a single database.

16 The NSRS is expanding to the Secondary level in 2019.

The NSRS suffers from technical limitations, such as the inability for schools to fully manage their records without the intervention of the Regional Education Offices (REOs). For example, students are automatically promoted in the NSRS every year and repeating students need to be highlighted manually by schools to REOs before records are updated. The same issue exists for student transfers, which are handled manually by school before being reported into the NSRS database by REOs.

Due to the above limitations, most schools do not yet have access to a single tool for the effective management of students. The schools themselves manifest the absence of integrated reports that allow them to have a complete view of all their students´ data. Schools should not only be considered while recording information, but the MOEYI should also provide them with tools and processed information that facilitate their daily management.

Another issue observed is that the MOEYI does not implement a digital notebook per student (registration of attendance/non-attendance, tardiness, grades, behavior, social conditions, etc.) with online access for parents, teachers and managers of the education system. This makes it impossible to track students' school performance online and provide early warnings for appropriate action. Those features are only found in commercial solutions implemented by some schools.

In terms of scope, the available systems provide limited features for schools and are mainly designed as one-way systems for the MOEYI to collect (limited) data on students. For instance, there is no systematized process or digital record of transportation services provided to students. Student attendance or behavior records are not systematically recorded digitally and there is currently no central and systematized process for issuance and registration of degrees, certificates and diplomas.

The transition to a new system such as the ESMS may disrupt individual data collection procedures already in place at school and regional levels under the NSRS. The fact that the MOEYI has conflicting plans for both the roll-out of a new ESMS system and the expansion of the NSRS to secondary grades is also a concern as the two systems overlap.

Articulations

This process does not have a system to support the management of relevant student sub-processes. The NSRS system, currently used from Grade 1 to Grade 7, is not integrated with the complementary systems used in this process. Integration with the systems used to support the other processes is also a challenge. As mentioned previously, the scheme of isolated and parallel systems currently observed prevents immediate response to elementary requirements, such as which teachers are in charge of which students. This aspect is relevant when analyzing academic trajectories and performance of students and teachers, both at the level of schools and of the MOEYI.

Management and related operational processes in schools are all paper based. Critical datasets such as student absenteeism are captured on paper at school level in attendance registries. Excel templates are filled out every month and sent to REOs for importation into FoxPro. Data is then sent to the

central MOEYI. Daily records such as attendance, marks, and behaviors should be directly managed in a digital format at the school level. Use of a mobile app could ease teachers' and/or other school employees' ability to capture data.

EMIS systems accessible in public schools are one-way systems used by schools to report to the MOEYI. Data reporting processes are considered as time consuming for schools. Feedback is almost non-existent. As school size increases, institutions may purchase their own commercial SIS.

Recommendations

The main recommendation under this process is to implement a single information system recording student level information for all education levels and providers, including for privately managed schools. The ESMS is an attempt to reach that goal, as was the NSRS. Whichever application is chosen, it must be integrated with modules found in other processes to constitute a single student base from which all the complementary attributes that make up the academic performance of students should be recorded, along with personal data, grades, attendance, course assignments, services granted, promotion, repetition, dropout, etc. Likewise, based on this unique identifier, benefits the student receives from the government should also be recorded nominatively, such as access to school transportation services, scholarships, school meals/canteen and any other assistance granted to the student.

Another recommendation is to carefully analyze the costs and benefits of migrating to the new ESMS application instead of improving coverage and scope of the current NSRS as it is already well known and used by schools. The EMIS functional and technical requirements document developed recently could be used as a starting point for this analysis.

Moreover, a costed and realistic implementation plan should be established for finalization, piloting and deployment of the selected solution, taking into account institutional, organizational, technical and human resource dimensions of the implementation. As mentioned earlier, while the ESMS is presented as the technical solution retained by the MOEYI, not all pre-requisites are yet in place to guarantee a successful rollout of the system. For example, if the system is going to be developed internally (which may not be the optimal solution for the MOEYI – see other processes), qualified teams should be recruited to develop and maintain the system. The budget associated with the implementation plan should reflect not only the initial investments for development and deployment of the system, but also the recurrent costs associated with it, such as hosting, maintenance and regular training for end-users.

Student records should be identified by a unique identifier allowing tracking of each pupils' progress in the education system through school years, grades, and schools. The identifier should ideally be usable by other government services to enable comprehensive monitoring of the provision of public services to any student. As such, the NID should be the preferred unique identifier. Depending on how the NID is distributed to the Jamaican population and at what age, proper integration mechanisms should be set up with the public administration in charge of NIDS's management to avoid redundant data entry and inconsistencies between the information stored in both the NIDS and the EMIS, notably civil status information, birth date, and so forth.

Related to this process, the ESMS (or equivalent application) should also implement a unique identification model of "School-Education Programme-Course-Student" in order to precisely manage the data about schools, education programmes as well as course attended by each student and assigned to each teacher.

It is also relevant in this process to consider schools as key players for management of the information stored in the system, and not as only data recorders. It is extremely important that the data recorded by the schools and the MOEYI return as processed information to the school in a precise, integrated and digital way, so that it can be used by principals for the daily management of their school. This information should also facilitate the compilation of school reports prepared by schools for the central administration, such as filling out of relevant parts of the Annual School Census forms.

In a high-impact EMIS, student registration in school or transfer requests are expected to be initiated directly online by parents or guardians, eliminating the administrative burden for schools.

With regard to the issuance and registration of diplomas, the MOEYI should also store information in the same system. For this, it would be convenient to provide features to schools and parents allowing them to directly register students into specific exams such as the CSEC. Students' results should also be available in the same platform to enable students to retrieve proof documents/certificates about obtention of any given exam.

In order to achieve a high impact EMIS, the student directory and information about each student should be made accessible securely to all administrative units and services in need of this information for management and monitoring purposes (teachers, school secretaries and principals, School Boards, regional supervisors, central MOEYI Divisions, etc.). Ultimately, access to information should also be strictly controlled to avoid any unauthorized access or edit of personal or sensitive information.

Finally, the functionalities recommended under the student and learning process should be an integral part of a larger single global solution also incorporating other processes studied in this document, thus avoiding duplication of information and discrepancies across EMIS sub-systems.

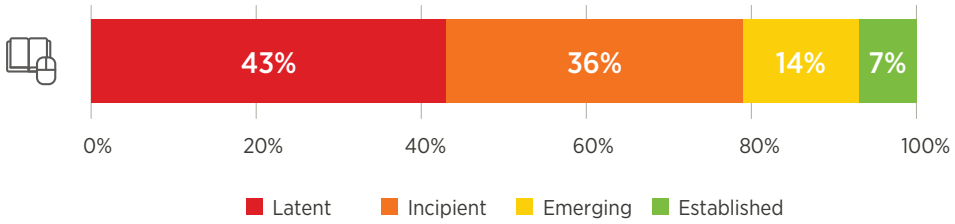
5.5 Process 5: Management of Digital Contents for Teacher Training and Student Learning

Main information systems supporting this management process:

> e-Learning Jamaica Virtual Learning Environment
> Primary Exit Profile (PEP)
> Book Fusion
> Learning Hub Online

Diagnosis: This process is at an Incipient stage of development (2). Figure 5.5.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 5.5.1: **LEVEL OF DEVELOPMENT OF THE DIGITAL CONTENT FOR TEACHER TRAINING AND STUDENTS' LEARNING SUBPROCESSES**



Source: own elaboration.

Strengths

An E-content committee was established in the Media Service Unit to review and approve electronic contents which could be procured by the MOEYI. The committee consists of curriculum specialists. Private publishers and individuals can propose contents for online publication. Interviews with MOEYI personnel underlined the absence of systematic evaluation of the impact of those services on student learning outcomes.

The MOEYI is deploying a comprehensive set of online digital contents and learning materials in the context of the implementation of the Primary Exit Profile. Other privately-run portals are also available to provide students with online resources relevant for them.

A new LMS platform is now under preparation in collaboration with E-Learning Jamaica Company Limited (e-Ijam), with a focus on the development of online learning materials for difficult subjects such as sciences. The new platform is expected to be released in September 2019. MOEYI also has a partnership with the British Council and OASIS Virtual Campus (like edX) for provision of online courses and programmes for teachers. Content is freely accessible for consultation. Payment is required to obtain a certificate.

The CXC also established a website based on NotesMaster where teachers can upload and share thematic content for learning, which is then accessible by students.

The MOEYI has a teacher training plan based on the needs of the curriculum which covers all teachers regardless of their geographical dispersion. Teachers have three days per year allocated to professional development. Training workshops are mostly conducted at the school level with master teachers. In-service professional development is completed through summer courses.

Challenges

The MOEYI does not have a central repository to store and share digital resources, with a powerful search engine, with classification of digital resources by educational level, access modality, type of resource and thematic area. The PEP online learning portal[17] is an attempt, but it does not contain materials for all grades.

Information on teacher professional development is mainly recorded on paper. It is not integrated with the teacher registry and HR files found in the MOEYI nor in the emerging JTC teacher registration database. The JTC wants to include professional development as one element of their teacher database, but the feature is not yet available.

The MOEYI does not perform any kind of virtual tutoring at the moment.

Teacher training on use and preparation of training contents is low. The JTC is currently reviewing a program to form part of the certification and appraisal of teachers, which is being developed in conjunction with Jamaica's University of Technology's Faculty of Education and Liberal Arts. Collaboration is also being sought with e-Learning Jamaica, which trains teachers on the use of ICT for learning. Through the "e-learning programme", basic ICT training is provided for secondary school teachers on how to develop digital contents.

There is no type of promotion/encouragement for the publication of innovative pedagogical experiences developed in schools. Government wants to include this criterion in teachers' assessment.

Articulation

The MOEYI is engaged in a number of initiatives to increase access and use of digital content for student learning. The Media Service unit has set up the required institutional processes for validation and publication of e-learning contents. Yet e-learning and digital content platforms remain dispersed and poorly integrated, making it difficult for learners to identify contents relevant for them. Moreover, some of the platforms established in the context of partnerships with private providers tend to encourage learners to register and to pay fees in order to access contents. The PEP learning portal initiative is an attempt to progressively build a central repository of freely available digital resources for learners.

Use of digital content for teacher training is at an incipient stage. Although there is intent to develop such training delivery modalities, usage remains sparse and is not systematized. The JTC is currently reviewing a programme which could be embedded in the certification and appraisal processes for teachers, developed in partnership with the University of Technology's Faculty of Education and Liberal Studies (FELS). Collaboration is also being discussed with E-Learning Jamaica (commercial provider) to train teachers on the use of ICT for learning. There are attempts to promote the development of digital content by teachers through an "e-learning programme" providing basic ICT skills to some secondary school teachers.

17 https://pep.moey.gov.jm/.

Recommendations

It is recommended to assess usage of the various platforms that have been set up by the MOEYI and to measure their impact on student learning outcomes.

It is also recommended to merge existing platforms into a single portal allowing quick identification and access to learning resources matching with student learning needs. Given the current momentum of the PEP initiative, this platform would be the best candidate to play this role. Initially designed for the primary level, this platform should nevertheless be extended to the secondary level if it is to become the main platform for providing digital content to pupils.

Ideally, data from e-learning platforms should be integrated into the student management system to ensure that students have access to content for them. For example, in the event that a student has mathematical difficulties identified in the student management system, the content management platform should be able to provide a list of relevant resources to overcome those difficulties.

It also recommended that schools be provided with tools to publish digital content for their learners. This could easily be done through the provision of collaborative blog services (e.g. WordPress), or more complex learning management systems (e.g. Moodle), on request from schools. Ideally, each school should be able to create and manage the content of its own website or digital work environment, allowing teachers and students to publish content about their class, lessons and school life. Such a digital space/hub can also allow teachers to share administrative and pedagogical resources.

With regard to teacher training, the MOEYI needs to accelerate deployment and use of digital resources for in-service professional development. Teachers should be given access to relevant online resources to improve their skills and also access relevant contents they could use in classrooms. It is thus relevant to consider integration of the e-learning/digital platform with the teacher professional development module of the EMIS.

The digital culture of the teaching staff should be improved to further generalize the use of digital technology in the training of students and teachers, which is currently limited. ICT skills should notably be fostered at the teacher pre-service training stage.

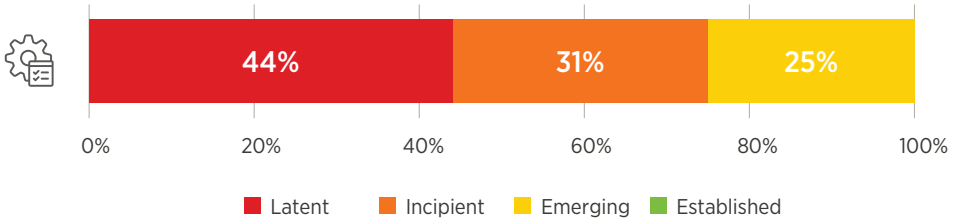
5.6 Process 6: Tools for Strategic Management

Main information systems supporting this management process:

> Annual School Census
> STATIN Database
> SPSS
> Excel

Diagnosis: This process is at an Incipient stage of development (2). Figure 5.5.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 5.6.1: **LEVEL OF DEVELOPMENT OF THE TOOLS FOR STRAGEGIC MANAGEMENT SUBPROCESSES**



Source: own elaboration.

Strengths

The information currently collected by the MOEYI informs decisions at all levels of the educational system. Although data quality and granularity[18] could be improved, available data provide a global and sector-wide overview of education sector dynamics.

Current data collection and reporting processes are well understood and managed by stakeholders, enabling timely publication of education statistics. The MOEYI reports regularly to national agencies such as the Statistical Institute of Jamaica (STATIN) and also to regional and international organizations such as UNESCO Institution for Statistics (UIS).

The MOEYI is able to produce a recurrent set of basic publications used for strategic planning, such as: Education statistical yearbook, one-pager education digest, school directory, school profiles. Reliable statistical indicators are produced yearly by the MOEYI, such as NER/GER, transition rates, intake rates, survival rates, as well as financial and budgetary indicators such as public expenditure on education. The MOEYI is able to access quality information such as demographic data produced by STATIN to generate indicators.

Available data is used for projections and simulations for educational planning and management and to inform policy dialogue. Future enrollments and impact on resource requirements and budget depending on policy options are projected.

18 Granularity, as a statistical terminology, refers to the scale or level of detail in a set of data.

Challenges

The quality of the statistical information produced by the MOEYI could be improved. Data completeness remains an issue as some schools are not yet included in MOEYI statistical reporting. The scope of the information used to inform strategic management could be expanded to provide decision makers with more granular details on various aspects of education sector characteristics, such as measurement of education sector performance in terms of optimization of resource allocations and measurement of learning outcomes and quality of education delivery. Weak areas include measurement of learning outcomes, teacher performance, absenteeism, infrastructure and equipment investment and maintenance needs, and investment in assistance services (transports, food, scholarships).

Information produced by the Ministry is not easily accessible for end-users, limiting its use for strategic management notably at the sub-national level. Strategic decisions are mainly based on statistical tables and reports compiled by the Planning Unit from the Annual School Census data, as well as from ad-hoc reports compiled on request by the various Units of the MOEYI based on the needs. Because of the absence of a normalized and shared repository of education statistics, strategic management decisions are not always based on the same information, leading to difficulties or eventually to inconsistencies in some of the decisions taken. For instance, figures about the number of teachers by level or number of students benefiting from a given social service may differ from one MOEYI Unit to the next when requested by senior management.

Available data is not shared across the education system in a way that fosters informed decision-making at each level. Education data is only available in the form of statistical yearbooks in PDF format and thus provides limited capabilities to data consumers for retrieving datasets answering their specific needs.

As discussed earlier, there is an absence of feedback loops to enable schools to effectively benefit from the statistics they generate for the MOEYI to inform their practices.

Articulation

Internally, this process relies on an established Annual School Census to monitor education service delivery in schools. While the census enables the MOEYI to collect and produce consistent historical summary statistics about the education system, the use of information remains limited outside of the planning Unit. The MOEYI should build on its strong culture for evidence-based decision making to bring tools for strategic management to the next level. The absence of business intelligence tools and dashboards for management is particularly striking. The annual census also makes it difficult for the MOEYI to monitor and analyze results and learning processes for students, making it difficult to detect deviations in early stages. Similarly, this process has no articulation with monitoring of teacher performance. Both aspects are crucial elements to have an impact on the monitoring of educational quality.

Recommendations

Ensure full coverage of all education providers when compiling education statistics. Private school registration and license renewal should be conditioned with timely and quality reporting into the EMIS. Linking school resource allocation (and funding) to the provision of accurate data could also be a means to ensure better coverage of the education sector and completeness of education data. In general, the MOEYI would benefit from using more granular data than that which derives from the annual census. Use of student, staff and infrastructure registry information would enable the MOEYI to expand the scope of its reporting capabilities, providing more accurate and real-time information for strategic management.

In general, it is recommended to foster informed decision-making at all levels by disseminating existing data in more innovative ways, while expanding the scope of available information at the same time.

In that regard, it is proposed to consider undertaking a data needs assessment. Current EMIS reports should be reviewed to ensure inclusion of graphical presentations. MOEYI reporting could be also enhanced to include other forms of data analysis such as subnational cohort analysis. Enhancement of needs analysis reporting to show development needs of schools by highest to lowest would bring added value to MOEYI reporting and ensure reports are linked to annual planning needs. Reports should be standardized and coded, while training materials should be developed to link reports to use in planning in accordance with the national and sub-national planning cycles. With reference to the data needs assessment, it is recommended to review the school census forms to ensure all required data is captured, in particular data on ICT and financial income and expenditure. This review of the data collection tools should be conducted with the progressive strengthening of transactional information systems on schools, students, HR resources and infrastructures in mind, so as to avoid duplication of work for schools at the time of data-entry. The deployment of an online data visualization and dashboard building portal also would be very beneficial to the MOEYI to support the dissemination of information and its use to inform decisions at national, regional and school levels.

Another recommendation stemming from the above is the setup of a data warehouse to establish a single repository of normalized education statistics for common use by MOEYI Divisions and Units. The Data warehouse would regularly receive information from EMIS sub-system(s) such as pupil assessment data, the NEI, JTC, etc. The major sources of information for the database (data warehouse) would be: (a) a school census system; (b) operational (transactional) and management systems in schools, universities and other education institutions; (c) data from other ministries and external government entities including population census, household and health surveys as well as student assessment systems; (d) other operational (transactional) systems managed within the MOEYI such as financial and human resources management systems. Access to the data warehouse information could be protected, with a public and a protected intranet access giving access to specific subsets of data.

It is also recommended to redesign and pilot school report cards to ensure they are compatible with the needs of school development planning. School report cards should be distributed back to schools and posted online on the MOEYI's EMIS website. School profiles could be presented as appealing

dashboards allowing comparison of school performance with the regional and national levels. Adding indicators on student results/performance would also bring additional value to the existing profiles.

NEI school inspection reports are very rich, published online and available for the general public. However, information is not in a format enabling quick analysis. Inspection report content should be summarized and normalized so that summary information can be stored in a single database enabling analysis and use of the inspection data in conjunction with other datasets produced by the MOEYI.

The deployment of a Results Based Management (RBM) collaborative platform to monitor and report on strategic/action plans implemented by the MOEYI would bring added value to the strategic management processes. Such a tool would facilitate the monitoring and evaluation (M&E) of indicators against planned targets and the measurement of deviations from planned activities, objectives and goals. Such a platform should enable each entity in charge of the implementation of a component of the plan to contribute to reporting through both formative and summative evaluations. Ideally, such a platform could also host school improvement plans to foster accountability at all levels.

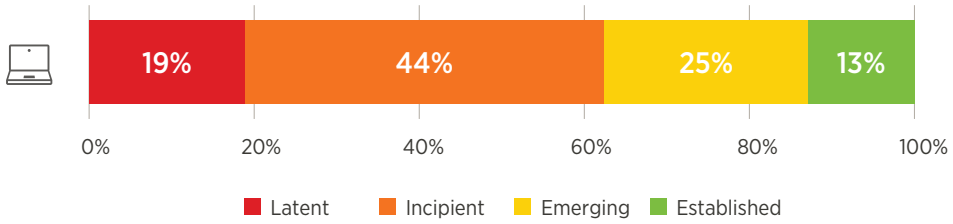
Finally, it is recommended to further strengthen the analysis of education system financing through the establishment of a National Satellite Account on Education (NEA). NEAs provide a comprehensive picture of the financing of the system and are important for countries committed to offering fee-free basic education, enabling them to estimate the right level of compensation for lost school revenues. Statistical understandings of the financing of education generally rely on the availability of finance ministry information on the budgets of the ministries in charge of education and on statistical surveys, such as those on household expenditure. This set of available information is certainly useful and can help in providing answers to specific questions. However, problems arise when a more global, consolidated picture of the economy of the education sector is sought. This requires the use of data from many different sources. The inconsistency of these sources, the lack of common definitions and classifications, the diversity of format, and the difficulty of accessing those sources (or, in some cases, their non-existence), prevent easy consolidation. The NEA addresses these difficulties by organizing multiple data according to a structured methodology and using a common set of definitions. Its aim is to capture and gather all financial flows within a coherent accounting framework to analyze the education sector's economy, covering both the funding and the production costs of activities.

6 STRUCTURAL CONDITIONS

6.1 Structural Condition 1: Technological Infrastructure

Diagnosis: This structural condition is at an Incipient stage of development (2). Figure 6.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 6.1.1: **LEVEL OF DEVELOPMENT OF THE TECHNOLOGICAL INFRASTRUCTURE SUBPROCESSES**



Source: own elaboration.

Strengths

Jamaica can rely on a developed network of telecommunications infrastructure. Most schools are connected to the internet through connectivity plans directly negotiated with telecom operators and paid directly from their budget. Overall, population connectivity to the internet is high, with a significant share of the population having smartphones and data plans.

The MOEYI was able to set up quality computer and network infrastructure for its central and regional administrations. MOEYI Units are equipped with a sufficient number of computers, with recurrent budget for regular upgrades. Intranet and internet connectivity are also satisfactory.

The MOEYI also has access to quality hosting services for its EMIS components. The MOEYI hosts some of its applications on locally hosted servers, while others are hosted on cloud infrastructures hosted in a national data centre. IT infrastructures comply with international standards in terms of redundancy, backup and security.

The Ministry has qualified, albeit understaffed, human resources to manage the various EMIS components.

The MOEYI provides efficient email services to its personnel, down to the school level (in public schools).

Challenges

Multiple specialized applications are in use or at the development stage and are not integrated together. Overall, there are growing issues of coordination between the EMIS sub-systems, notably linked to the expansion of the number of specialized agencies under the MOEYI (ex: JTC). As mentioned earlier, EMIS sub-systems and their data remain poorly integrated. The ESMS is an attempt to solve this issue, but it is not clear at this stage if it will be able to integrate all system requirements for a high impact EMIS.

Some critical EMIS sub-systems are running on old technologies (FoxPro) that are no longer supported by the technology providers. For example, the School Census application is using the FoxPro technology which only runs on old 32bit hardware. Microsoft technical support and development of FoxPro ended in 2005.

While a large share of schools is connected to the internet, quality of the service is an issue in many public schools (bandwidth and service interruptions), particularly in rural areas. Sample reports from Regions 1, 3 and 5 shared by the MOEYI highlight that although 100% of schools have access to internet, only 53% have internet access at adequate speed. Secondary schools are better connected and better equipped than infant and primary schools. School connectivity will be a growing issue if online interactions with schools are going to increase.

A large share of schools do not have working ICT equipment such as computers for school administration or computer labs. More than 80% of infant and primary schools report not having adequate ICT equipment such as computers (32% in secondary schools).

Although the MOEYI relies more and more on adequate technologies such as user Single Sign-on for some of its EMIS applications, measures in place for user identity protection remain dispersed and are not standardized across EMIS sub-systems.

Basic security rules are in place in all EMIS applications. However, the tracking of changes over datasets is not implemented systematically. The MOEYI also does not have any mechanism to audit sensitive data that can be modified by users of the system.

Recommendations

In terms of ICT infrastructures, the Ministry should accelerate the provision of equipment to public schools, notably in infant and primary schools. The procurement plan should be aligned with the deployment plan of a central school management system such as the ESMS to ensure that once the system is in place, it can be used by all schools. Otherwise, there is high risk of failure for the new system, as it will be unable to achieve data completeness.

While EMIS sub-systems could work in relative autonomy to serve the thematic needs of each agency, it is critical for the MOEYI to ensure that coordination and integration processes are in place to reduce data mismatch and redundancy across the systems. It is recommended that the MOEYI maintains shared repositories and nomenclatures for record classification so that all MOEYI agencies can rely on the same data standards.

Standard operating procedures should be also developed to document how business workflows are linked with the EMIS workflows.

In terms of the hosting of EMIS services, the MOEYI should preferably rely on a national data center and on infrastructure as a service hosting modality instead of self-hosting. This would significantly reduce the risks for hardware failure, as a data center is a structure dedicated to 24/7 large-scale data processing and handling operations, placing a priority on providing secure and uninterrupted service, and generally includes industry-grade redundant or backup power systems or supplies, redundant data communication connections, environmental controls, fire suppression systems, and numerous security devices, which are not found or too costly to maintain when self-hosted.

The MOEYI should also establish and comply with an EMIS maintenance and periodic support policy to ensure that all EMIS sub-systems can be sustained. The Annual Census is a good example of an application that would have been upgraded under such a policy, so that it is not left behind but updated to rely on current and supported technologies.

The MOEYI's mandate is not to develop software such as the ESMS or other equivalent solutions. Externalization of software development to specialized organizations is highly recommended. Internal development leads to risk of dependency on few specialized staff in charge of the development of the applications, as well as to the progressive decrease in source code quality. This is even more critical in a context of high staff turn-over and low retention capacity of the MOEYI to keep skilled IT profiles due to low salary scales compared to the private sector. Instead, the MOEYI should build an EMIS team able to manage and monitor the systems in place and to ensure that the MOEYI's requirements are met each time a technical solution is selected.

Among areas to be prioritized by the MOEYI's IT team, the establishment of integrated IT system and data auditing procedures stands out, as well as ensuring the interoperability of EMIS components with other external information systems. The MOEYI could notably set, publish and implement data exchange protocols such as APIs built on recognized standards for data exchange and aligned with government requirements (ex: SDMX, CEDS) to enable commercial SIS solutions to comply with MOEYI requirements, and to enable MOEYI systems to easily interact with other government information systems.

It is also recommended to upgrade the School Census application to up-to-date technologies and to integrate it with the school management system to enable automatic filling out of the census questionnaires from school data (even partial).

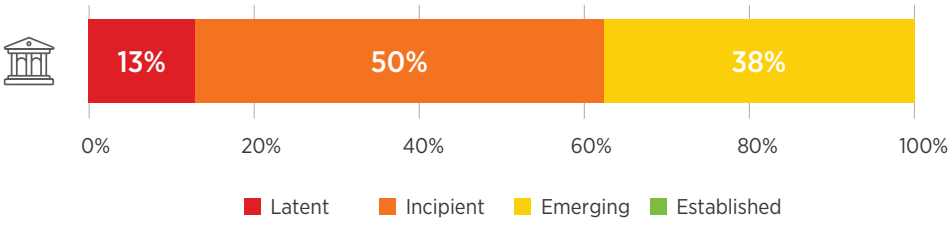
Interviews conducted in schools highlighted a strong interest by pedagogical and administrative staff for having specific features to facilitate school management that could be embedded in the school information: parent communication, attendance and mark reports, time scheduling, class management, financial module, WhatsApp messaging service.

Finally, as stated in the recently released MOEYI ICT policy, it is recommended to foster the use of Free and Open Source Solutions (FOSS) and open standards for development of information systems instead of proprietary systems, as to avoid high licensing costs and reduce maintenance costs. In any case, The Total Cost of Ownership (TCO) of FOSS must be assessed to ensure that appropriate systems that meet user requirements and the overall needs of the education system are affordable.

6.2 Structural Condition 2: Governance and Institutional Framework

Diagnosis: This structural condition is at an Incipient stage of development (2). Figure 6.1 shows the percentage of sub-processes by level of development. The main results are described below.

FIGURE 6.2.1 **LEVEL OF DEVELOPMENT OF THE TECHNOLOGICAL INFRASTRUCTURE SUBPROCESSES**



Source: own elaboration.

Strengths

Since 2017, the Government of Jamaica is accelerating investment in e-governance and digital transformation aimed at becoming the leading e-government in the region. E-Gov Jamaican reforms are mainly modeled after the features of e-governance found in Estonia, where 90% of the Estonian Government's services can be accessed online. The National Identification System (NIDS) is foreseen as the main platform for e-governance locally. The NIDS will secure the identity of citizens and facilitate online tax payments and digital management and online delivery of social welfare services. The Access to Information and Data Protection Acts are currently being debated, unfolding legislations on privacy, cybercrime and other subjects.

There is a rapidly emerging general regulatory framework at Government level driving ICT change in public administrations. The EMIS processes found in MOEYI, although at an incipient stage, are more and more aligned with the national standards and guidelines for development and implementation of public sector information systems.

The government is implementing an e-governance strategy in which the MOEYI is prioritized. This is an opportunity that gives weight to MOEYI's recommendations on how EMIS processes could be streamlined and better integrated with external systems.

The MOEYI's Policy Unit guides the compliance process of ministry's policies with the Acts and other government regulations. MOEYI officers in charge of interpreting the Act and of ensuring compliance of MOEYI's processes with it, prepared a Data Sharing policy now in Cabinet Office for review. School records are considered as strictly confidential information.

An ICT in Education policy has been elaborated with support from UNESCO. Stemming from it, a 5-year ICT Master Plan with the following components is now at draft stage:

> Policy Goal 1: Learning Opportunities for All
> Policy Goal 2: Transforming the Teaching and Learning Process
> Policy Goal 3: Efficient Management and Administration of the Education System
> Policy Goal 4: Nurturing Talent and Innovation

Among crosscutting themes, information systems are meant to play a key role for the delivery and monitoring of education policies formulated in the plan. A Steering Committee has been established to guide and monitor the implementation of ICT in education policies and plan activities.

The ICT in Education framework is also reflected in the larger National Education Strategic Plan (2011-2021) of the ministry. The MOEYI delivers the overall plan components through well-structured three-year rolling plans with their corresponding operational plans from which the ministry's yearly budget is established.

There is a vision from the MOEYI's leadership team to streamline the existing dispersed information systems and databases into a comprehensive and integrated EMIS.

Finally, an analysis of the functional and technical requirements exists for the implementation of a comprehensive enterprise school information system.

Challenges

There is absence of a comprehensive EMIS roadmap articulated with both government level e-governance strategies and MOEYI's ICT in Education strategy. There is also absence of a costed and realistic detailed EMIS implementation plan.

The absence of a roadmap leads to the mushrooming of uncoordinated information system development initiatives (as illustrated in Table 4.2.1), often serving short-term needs of the specific thematic team within the MOEYI, without enough coordination with the relevant units and divisions. This leads to duplication of datasets and redundancy of operations.

The current short-term roadmap for finalization, testing and deployment of the ESMS is unrealistic, with a high risk of failure. As far as the ESMS project is concerned, there is still an important amount of work to be done in order to achieve an in-depth plan leading to the emergence of a comprehensive and well-integrated system responding to the needs of all EMIS sub-processes.

Given the quantitative and qualitative scarcity of qualified personnel, it is unlikely that the MOEYI will be able to successfully finalize a project of the size and scope of the ESMS.

Finally, it is observed that the MOEYI does not have a change management plan to support the implementation of its EMIS strategic objectives.

Recommendations

In terms of strategic planning, it is essential for the MOEYI to formulate a realistic EMIS strengthening plan including the adjustments suggested in this document. This plan must be precise in terms of objectives, scope, stages of implementation, dates and the human and financial resources associated with it. In addition, it is expected that this project will require the consensus of all the areas in which process changes will have an impact and, above all, the endorsement of the highest authorities of the MOEYI, with the guarantee of the necessary budgetary resources to complete the project.

To achieve successful and sustainable implementation, four levels of capacities should be considered when elaborating the plan:

> Institutional capacities: norms, regulations, budget
> Organizational capacities
> Human resource capacities
> Technological capacities

In order to ensure timely and sustainable implementation of the EMIS strengthening plan it is essential to link it with a change management plan detailing the relevant actions, stipulated dates and required resources. Such actions could incorporate awareness-raising activities, training days on the use of new

applications, demonstration spaces regarding the importance of integrated information exploitation, and should accompany the implementation process throughout.

The MOEYI should adopt a realistic HR strategy for EMIS system development and maintenance. Employment conditions in the MOEYI need to be attractive enough to recruit highly skilled IT staff required to develop national IT systems. Unless the MOEYI is ready to increase financial resources to sustain an IT development team, it is preferable to rely on existing commercial or open-source solutions instead of developing internal applications. The MOEYI's mandate is not to develop quality software. Instead, financial efforts could be targeted to establish a reduced but skilled IT team capable of assessing the quality of IT services delivered by contracted entities and to manage and monitor hardware and software products.

7 EMIS STRENGTHENING PLAN

7.1 Proposal for Strengthening the EMIS and the Critical Path for its Implementation

The proposed strengthening plan for the EMIS in Jamaica has actions for which results will be achieved gradually depending on the flow of investment made. This section starts by presenting the desired state for a high impact EMIS based on the finding of this report and then describes components of the strengthening plan, including estimated time and priority for each activity (see Table 7.1.1). The plan is divided into two main sets of activities: **Level I** activities correspond to short-term priority actions that should be initiated as soon as possible by the MOEYI to set the groundwork for successful implementation of **Level II** activities, which are medium to long-term actions required to reach the desired state of high impact EMIS.

Desired State of EMIS

Based on the situation observed in Jamaica and building from recommendations proposed in this document as well as from best EMIS implementation practices observed worldwide[19], the following conceptual architecture in Diagram 7.1.1 is proposed to transform the current Jamaican EMIS into a high impact solution that underpins the development and implementation of robust national sector policies and plans, appropriate levels of sector management, and monitoring & evaluation (M&E).

The conceptual architecture relies on a set of integrated **master datasets,** with which MOEYI officers at central and regional levels would interact through **dedicated management systems** serving the needs of each MOEYI operational area:

> Human Resource and Administrative Position Management System;
> School Management Information System;
> Infrastructure and Equipment Management Information System;
> Student Management System;
> Digital Content Management System.

19 For more details on international best practices:

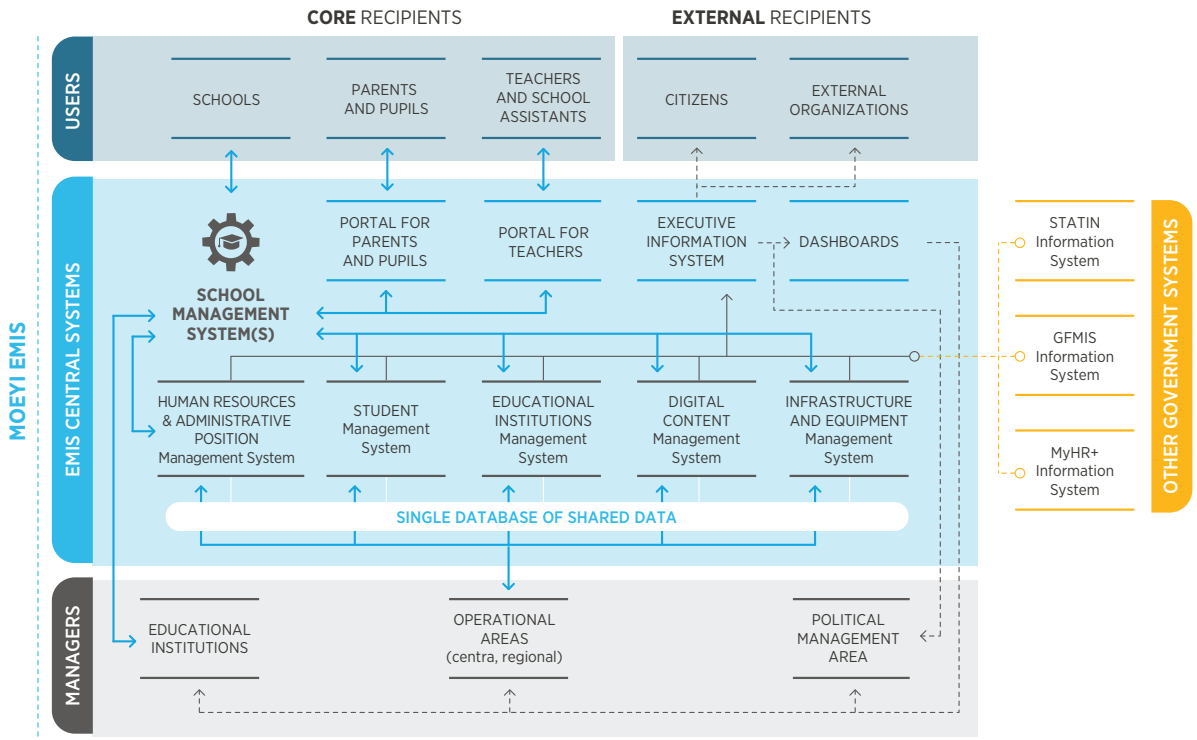
- IDB (2019) https://publications.iadb.org/publications/english/document/From_Paper_to_the_Cloud_Guiding_the_Digital_Transformation_of_Education_Management_and_Information_Systems_SIGEDs.pdf.

- UNESCO (2018), Re-orienting Education Management Information Systems (EMIS) towards inclusive and equitable quality education and lifelong learning, http://unesdoc.unesco.org/images/0026/002619/261943e.pdf.

- Abdul-Hamid, Husein. 2017. Data for Learning: Building a Smart Education Data System. Directions in Development—Human Development. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/28336. License: CC BY 3.0 IGO.

Those specialized information systems can be implemented separately by MOEYI's central Ministry (or its specialized agencies) or be integrated into a single application. In both cases, they should rely on the same shared underlying datasets and share the same data classifications and nomenclatures. The information system(s) should be able to record every transaction in real-time to keep track of all changes and history. They should also enable validation of each data insertion/modification and deletion through adjustable data validation workflows able to reflect business logics found in each MOEYI operational area.

DIAGRAM 7.1.1: **CONCEPTUAL DIAGRAM FOR HIGH IMPACT EMIS**



Source: own elaboration.

Some of the MOEYI management systems should also be able to exchange information with external government systems such as STATIN, GFMIS, MyHR+ or any other system that may be relevant. **Data exchanges should be implemented through normalized APIs** as per the rules and regulations stipulated by government. They would also interact with other key components of the target EMIS architecture:

- The **executive information system** consists of a set of tools to support informed strategic planning, monitoring and evaluation as well as establishment of data feedback loops fostering informed decision-making at national, regional and school levels. It consists of: (1) an **annual school census platform** authorizing online data entry at school level, as well as aggregation of information from core data registries when available; (2) a **statistical data warehouse** centralizing all key statistics used by the Ministry; (3) a **data analysis and dashboard** online application for data visualization;

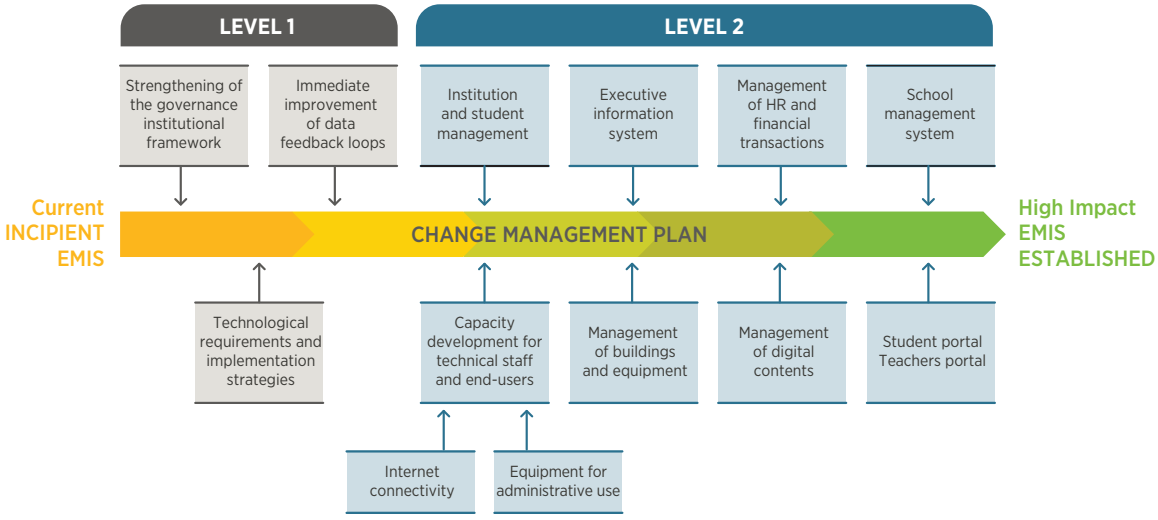
and (4) a **Results-Based Management (RBM)** online application to manage and monitor Education Sector Plan(s) activities. Based on a data dissemination policy adopted by the MOEYI, some of the information stored in the executive information system could be accessed by external users such as citizens and local, national or international organizations (ex: UIS).

- The **school management system (SMS)** component of the target solution consists of a single online application in which every school can access its own virtual space to manage administrative and learning matters, or as a collection of individual SMS solutions for schools. As stated earlier in the report, it is recommended that the MOEYI deploy its own solution for public schools but also enable other schools from the private sector to rely on their own commercial solution, provided those are upgraded to interact seamlessly with the core MOEYI information systems using standardized APIs and normalized data exchange formats published by the MOEYI.

- Finally, attached to the school management systems, **portals** would be made available to parents, pupils, teachers and other school personnel to access information relevant for them. These portals would also offer **e-learning and professional development** functionalities.

The proposed path to reach the desired state of a high impact EMIS is illustrated in Diagram 7.1.2. It shows the proposed sequence of implementation of the main actions under Level 1 and Level 2 of the strengthening plan to move from an Incipient to an Established EMIS.

DIAGRAM 7.1.2: **SEQUENCING OF THE EMIS STRENGTHENING PLAN**



Source: own elaboration.

This sequencing of actions has the purpose of segmenting the investments required by the MOEYI to achieve a high-impact EMIS. Depending on the availability of resources, adjustments could be made to the proposed investment flow.

Level I Actions

For Level I, the EMIS strengthening plan prioritizes actions stemming from the recommendations of this report that are able to: (1) bring short-term added value to current EMIS processes and (2) set the groundwork for successful and sustainable implementation of Level 2 mid- to long-term actions:

A - Strengthening of the EMIS governance and institutional framework

(1) Establish an EMIS steering committee to drive the EMIS transformation in the MOEYI.

(2) Formulate a realistic and costed EMIS Strategic Plan setting overall strategies, directions and timelines for strengthening the EMIS. The plan should be aligned with the E-governance framework, MOEYI's strategic plan and the ICT strategy.

(3) Conduct an initial data needs assessment followed by the development of a Data Management Framework (DMF). The data needs of the different stakeholders and actors would be regularly reviewed. As needs changed, gaps in the current data collections would be identified. As part of the data management framework (DMF), detailed data specifications would be maintained and updated. The census database and the data warehouse would be regularly updated to conform to the updated data specifications and the changing needs. Indicators required for monitoring and evaluation would also fall under the data management framework. The data framework would provide detailed descriptions of: (a) the list of indicators used for reporting; (b) data recorded in the online census system; (c) data collected from the operational systems; (d) clear definitions and glossaries of terms; (e) coding and classification schemes; (f) identifier schemes for major entities; (g) definitions of all compliance reports for all departments; and (h) definitions of all indicators and other forms of measurement.

(4) Develop an EMIS change management plan.

(5) Establish regulations to strengthen registration and licensing renewal mechanisms for non-public institutions.

B- Identification of the technological requirements and their implementation strategies

(6) Revise and expand available technical and functional requirement documentation in light of the recommended high-impact EMIS architecture.

(7) Assess usage of the various digital platforms that have been set up to measure their impact on student learning outcomes.

(8) Conduct a cost/benefit analysis for migration from the NSRS to the new ESMS.

(9) Develop costed implementation plans for deployment of each component of the MOEYI's EMIS architecture.

(10) Prepare an OrangeHR to MyHR+ transition plan in coordination with the MOFPS.

(11) Develop an EMIS maintenance and periodic support policy to ensure that all EMIS sub-systems can be sustained.

(12) Develop Standard Operating Procedures (SOPs) documenting how business workflows will be linked with EMIS workflows.

C- Immediate improvement of data feedback loops

(13) Set up a central data warehouse for storage and archiving of education statistics and indicators and migrate all existing official statistics into it.

(14) Revise the current annual census questionnaires in light of the needs identified in the data management framework.

(15) Redesign and pilot school report cards.

Level II Actions

Under Level II, the proposed actions are substantive in the field of information system development. Although special recommendations were made in each of the processes addressed in this report, the substantial aspect of Level II action is the development and implementation of the recommended components of the high-impact solution presented in Diagram 7.1.1.

A- Technological requirements for schools

(1) Improve school connectivity and ensure availability of minimum IT equipment in all public schools (with priority given to infant and primary schools).

(2) Migrate all EMIS components to virtualized environments hosted on a national or international TIER III or TIER IV Datacenter.

B- Institution and student management

(3) Deploy an online sector-wide directory/register of uniquely identified schools, with various access levels for the MOEYI, REOs and schools.

(4) Implement a student information system to record student level information for all education levels and providers, including for non-public schools.

C- Consolidation of the executive information system

(5) Upgrade the School Census system to up-to-date technologies, allowing for online data entry from schools and/or regional education offices, and integrated with SMS to enable some parts of the questionnaire to be filled out automatically.

(6) Enhance quality and granularity of education statistics through improvement of data completeness and use of student, staff and infrastructure information captured in the MOEYI master datasets.

(7) Deploy data analysis and dashboard online application for data visualization.

(8) Deploy a Results-Based Management (RBM) online application to manage and monitor Education Sector Plan(s) activities.

(9) Strengthen analysis of education system financing through the establishment of a National Satellite Account on Education (NEA).

(10) Implement Education Simulation Modelling for scenario planning.

D- Management of buildings and equipment

(11) Deploy an information system for management of school buildings and equipment, including registers of school buildings, assets and equipment as well as school maintenance visits, maintenance requests and intervention management.

(12) Conduct a comprehensive inventory of school infrastructure with evaluation of its condition (to be carried out by qualified experts).

E- Management of Human Resources and financial transactions

(13) Deploy an HR management solution complying with MyHR+ requirements to enable all administrative levels to have a comprehensive, precise and real-time view of human resources deployed in schools.

(14) Deploy a teacher professional development platform.

(15) Deploy an online portal for publication of open/vacant positions and management of recruitment/hiring processes by schools.

(16) Provide a standardized accounting platform enabling public schools to maintain their financial records and the MOEYI to report information into the GFMIS.

(17) Digitalize payment request workflows at the sub-national level to reduce the data entry workload at the central ministry.

F- Management of Digital Contents

(18) Merge existing platforms' contents into a single repository allowing for quick identification and access to learning resources matching with student learning needs.

G- School Management Systems

(19) Establish and publish normalized data exchange formats to be used by commercial solutions and by MOEYI external agencies to enable bi-directional data exchange with MOEYI core datasets and the annual census platform.

(20) Deploy a school management system for all public schools, including a digital hub enabling publication of digital resources for learners. This could easily be done through the provision of collaborative blog services (e.g. WordPress), or more complex learning management systems (e.g. Moodle), on request from schools.

H- Student and Teacher Portals

(21) Enable teachers, and education staff in general, to have access to an online portal where they could consult their personal HR records.

(22) Integrate e-learning platforms into the student and teacher portals. Provide teachers with access to relevant online resources to improve their skills and also access relevant contents they could use in classrooms.

I- Capacity development for technical staff and end-users

(23) Develop and execute a training plan for staff in charge of the EMIS. Particular attention should be given to training in the area of Cloud technology, servers and network infrastructures, database management, and on the software and underlying technologies on which EMIS components will be developed. Performance tuning of mission-critical applications is also relevant to consider when formulating the training plan.

(24) Develop and execute a training plan targeting EMIS end-users at central, regional and school levels as detailed in the change management plan presented in the subsequent section of this report.

(25) Establish a support help desk for end users. The help desk would be responsible for channeling queries from schools and from central MOEYI units, through telephone, online ticketing system and chat. Considering that the change management plan includes training for end users and the system will be progressively deployed in schools in sequential order, it is suggested to have one (1) operator per 100 users for the first 12 months of use of the system. After this initial stage, the level of support required is likely to be lower and therefore the ratio could be reduced to one (1) operator per 300 users.

TABLE 7.1.1: **EMIS STRENGTHENING PROPOSAL**

EMIS STRENGTHENING PLAN COMPONENTS	ESTIMATED TIME*	PRIORITY**
LEVEL I		
A - STRENGTHENING OF THE EMIS GOVERNANCE AND INSTITUTIONAL FRAMEWORK		
(1) ESTABLISH AN EMIS STEERING COMMITTEE	2w	1
(2) FORMULATE AN EMIS STRATEGIC PLAN	3m	1
(3) INITIAL DATA NEED ASSESSMENT FOLLOWED BY DEVELOPMENT OF A DATA MANAGEMENT FRAMEWORK (DMF)	3m	1
(4) EMIS CHANGE MANAGEMENT PLAN	2m	1
(5) ESTABLISH REGULATIONS TO STRENGTHEN REGISTRATION AND LICENSING RENEWAL MECHANISMS FOR NON-PUBLIC INSTITUTIONS	6m	1
B- IDENTIFICATION OF THE TECHNOLOGICAL REQUIREMENTS AND THEIR IMPLEMENTATION STRATEGIES		
(6) REVISE AND EXPAND AVAILABLE TECHNICAL AND FUNCTIONAL REQUIREMENT DOCUMENTATION	1m	1
(7) ASSESS USAGE OF THE VARIOUS DIGITAL PLATFORMS	2w	1
(8) CONDUCT A COST/BENEFIT ANALYSIS FOR MIGRATION FROM NSRS TO THE NEW ESMS	2w	1
(9) DEVELOP COSTED IMPLEMENTATION PLANS FOR DEPLOYMENT OF EACH COMPONENT OF THE MOEYI EMIS ARCHITECTURE	1m	1
(10) ORANGEHR TO MYHR+ TRANSITION PLAN	1m	1
(11) EMIS MAINTENANCE AND PERIODIC SUPPORT POLICY	2w	2
(12) STANDARD OPERATING PROCEDURES (SOPS)	1m	2
C- IMMEDIATE IMPROVEMENT OF DATA FEEDBACK LOOPS		
(13) SETUP A CENTRAL DATA WAREHOUSE AND MIGRATION OF ALL EXISTING OFFICIAL STATISTICS INTO IT	3m	2
(14) REVISION OF ANNUAL CENSUS QUESTIONNAIRES	1m	2
(15) REDESIGN AND PILOTING OF SCHOOL REPORT CARDS	1m	2
EMIS STRENGTHENING PLAN COMPONENTS	ESTIMATED TIME*	PRIORITY**
LEVEL II		
A- TECHNOLOGICAL REQUIREMENTS FOR EDUCATIONAL INSTITUTIONS		
(1) IMPROVEMENT OF SCHOOL CONNECTIVITY AND IT EQUIPMENT	NA	3
(2) MIGRATION OF EMIS COMPONENTS TO TIER III OR TIER IV DATACENTER.	NA	3
B- INSTITUTION AND STUDENT MANAGEMENT		
(3) ONLINE SECTOR-WIDE DIRECTORY/REGISTER OF EDUCATIONAL INSTITUTIONS	2m	1
(4) STUDENT INFORMATION SYSTEM	6m	2
C- CONSOLIDATION OF THE EXECUTIVE INFORMATION SYSTEM		
(5) SCHOOL CENSUS SYSTEM UPGRADE	4m	2

(6) IMPROVEMENT OF DATA COMPLETENESS AND GRANULARITY FOR REPORTING	2m	2
(7) DATA ANALYSIS AND DASHBOARD ONLINE APPLICATION FOR DATA VISUALIZATION.	3m	2
(8) RESULT-BASED MANAGEMENT (RBM) ONLINE APPLICATION	1m	2
(9) NATIONAL SATELLITE ACCOUNT ON EDUCATION (NEA).	2m	4
(10) EDUCATION SIMULATION MODELLING FOR SCENARIO PLANNING.	2m	4
D- MANAGEMENT OF BUILDINGS AND EQUIPMENT		
(11) INFORMATION SYSTEM FOR MANAGEMENT OF SCHOOL BUILDINGS AND EQUIPMENT	6m	2
(12) INVENTORY OF SCHOOL INFRASTRUCTURES	6m	2
E- MANAGEMENT OF HUMAN RESOURCES AND FINANCIAL TRANSACTIONS		
(13) HR MANAGEMENT SOLUTION COMPLYING WITH MYHR+ REQUIREMENTS	6m	2
(14) TEACHER PROFESSIONAL DEVELOPMENT PLATFORM.	3m	2
(15) ONLINE PORTAL FOR PUBLICATION OF OPEN/VACANT POSITIONS AND MANAGEMENT OF RECRUITMENT/HIRING PROCESS BY SCHOOLS.	1m	2
(16) STANDARDIZED ACCOUNTING PLATFORM FOR PUBLIC SCHOOLS	6m	2
(17) DIGITALIZE PAYMENT REQUEST WORKFLOWS AT SUB-NATIONAL LEVEL	6m	2
F- MANAGEMENT OF DIGITAL CONTENTS		
(18) MERGING EXISTING DIGITAL CONTENT PLATFORMS INTO A SINGLE REPOSITORY	1m	4
G- SCHOOL MANAGEMENT SYSTEMS		
(19) ESTABLISHMENT AND PUBLICATION OF NORMALIZED DATA EXCHANGE FORMATS	3m	3
(20) DEPLOY A SCHOOL MANAGEMENT SYSTEM FOR ALL PUBLIC SCHOOLS	8m	2
H- STUDENT AND TEACHER PORTALS		
(21) ONLINE PORTAL FOR TEACHERS, AND EDUCATION STAFF	5m	2
(22) E-LEARNING PLATFORMS FOR STUDENT AND TEACHERS	5m	3
I - CAPACITY DEVELOPMENT FOR TECHNICAL STAFF AND END-USERS		
(23) TRAINING OF TECHNICAL STAFF	6m	2
(24) TRAINING OF END-USERS	6m	3
(24) SUPPORT HELP DESK	2m	2

Source: own elaboration.

7.2 Main Benefits of the Strengthening Proposal

The main benefits to be gained as the strengthening proposal is progressively implemented are described below:

- Having a comprehensive institutional project, supported by the highest MOEYI authorities, will allow precise short, medium- and long-term identification of targets in terms of management processes and their associated information systems.

- The development and implementation of a comprehensive change management program, involving schools, pedagogical and administrative areas, will unify efforts behind common agreed upon objectives.

- The implementation of a single comprehensive solution for schools will generate a substantial reduction in their administrative burden, allowing them to focus their actions on pedagogical aspects.

- The implementation of school management integrated into the core EMIS platform will provide integral support to the actions of the School Boards, providing transparency and efficiency in the processes of transfers, executions, budgetary control, accounting and digital accountability of expenses to the MOEYI.

- The proposed model also makes allocation for use of commercial and government school management information systems. Commercial school management systems would conform to data export and import guidelines established through the MOEYI so as to conform to the master data repositories and the data warehouse. The use of commercial school information systems for school management should be encouraged in schools where the cost benefits are realized through more efficient school management and increased teacher and parent participation.

- The incorporation of a module for the management of plans, careers, subjects and their assignment to the schools that implement them, will add efficiency to the process and will allow for on-line and precise information of the educational offerings available in an institution or in a region.

- The creation of a single register of buildings will provide accurate data on movable property, equipment, available services and infrastructure interventions. This will enable the resources allocated to school infrastructure to be correctly targeted.

- Having all the institutions connected to the Internet, with minimum technological equipment, will allow schools to perform their operations in an efficient manner, with the consequent reduction of time dedicated to administrative tasks.

- The use of unique identifiers for buildings, institutions, positions, teachers and students will facilitate management, in particular their tracking over scholastic years and their association with

the other components of the education system (e.g.: position-teacher-section-student, institution-school-course, teacher-institution-building).

- The implementation of a single personnel register will bring a marked improvement in the management of human resources by having all the information unified and available online. The main improvements will be linked to better control of absenteeism; the selection of the best qualified replacement personnel; the settlement of payrolls; the management of the retirement processes and the development of the teaching career.

- Teachers' access to their single register through the Internet will provide transparency and online control of the data that the government has on each agent.

- The implementation of a single register of students will allow for the construction of an online trajectory of each student into the education system, the fulfillment of information requirements of other organizations, and precision in the assignment of assistance related to food and transportation. This model will result in a significant reduction in administrative bureaucracy, significant savings in school principals' resources and time, and improvements in the decision-making process.

- The management of the issuance and registration of degrees, analytical certificates and diplomas in a digital and centralized form will produce notable improvements in terms of reliability of such documents.

- Secure, real-time access for parents and guardians of students will improve family accompaniment in the student's teaching and learning process.

- Comprehensive management of the teacher training plan, with access and coverage by means of an LMS, will make it possible to offer online in-service training to all teachers in need. Likewise, the integration of the result of these activities into the single teacher register will provide valuable online information on comprehensive teacher education.

- The use of digital pedagogical resources in the process of curricular formation, will allow for inclusion of technologies in the formative processes.

- The implementation of enhanced technological environments with corresponding infrastructure will ensure availability of required technological support for proper management of the systems.

- Implementing the suggested adjustments (functionalities such as workflows, identity protection, cybersecurity management, and audit on modifications) will bring improved coverage and reliability to the information.

- The incorporation of dashboard, result-based management and simulation tools will provide online access to relevant information for decision making and monitoring, favoring the definition of evidence-based and cost-effective public policies and the measurement of their impact.

7.3 Change Management Proposal

The most relevant aspects of change management associated with the proposed strengthening plan are synthesized in this section.

The EMIS transformation should be driven by an EMIS Steering Committee, which should be chaired by a high-level political figure with a high level of involvement in the project. In addition, it is recommended to include the following stakeholders in the committee:

- An EMIS platform project leader attached to the Permanent Secretary's Secretariat;
- The leader in organizational/process reengineering;
- The head of the Management Information Systems Unit;
- The head of the Legal Services Unit;
- A representative of each central administration Division and MOEYI specialized agencies;
- A representative of the regional administration;
- A representative from schools at each level;
- Two School Board representatives;
- Two primary and secondary school teachers and/or a union representative.

This committee should be constituted at the beginning of the project to drive the overhaul of the EMIS within the ministry. Among the committee's relevant functions will be those associated with approval of implementation plans in each technical area, the monthly follow-up of their execution and the dissemination and monitoring of the actions to be carried out by the required stakeholders. The committee should have an executive management role and not an operational one. The operational management of the change management plan should be led by professional experts in each of the actions and topics developed. The actions of the committee should be sustained in the short, medium and long term, until the consolidation and appropriation of the new EMIS is achieved.

With regard to the change management plan itself, well-differentiated groups can be identified to implement actions of sensitization, training and induction. These are: schools, School Boards, students, teachers, MOEYI administrative staff and political management officials.

In general terms, it is convenient for all groups to design capacity development activities inducing the use of technology. It is likely in the student group that the least resistance and most familiarity with the use of ICT resources is found. In the areas of teaching and schools, it is recommended that specific actions be developed to guarantee entire coverage of the educational system at all levels.

At the level of administrative and senior management personnel, it is necessary to carry out separate specific basic trainings in order to turn technology into an allied resource. For this purpose, it is convenient to establish weekly workshops where, working on specific problems, technological resources would be used to solve the identified issues.

Once the first level of the strengthening plan is completed, it is essential to continue to strengthen capacities through operational trainings on the new tools that will be used by institutions, teachers, regional and central administration. It is recommended to develop specific trainings for each functional area of the tools to be used by each target group. For example, for teachers to record marks and student attendance; for HR personnel to manage positions, recruitment, etc.; for management personnel, focus should be given to use of monitoring dashboards, indicators and result-based management.

A critical success factor of the EMIS strengthening plan is the sensitization, induction and training of school personnel and School Boards. In the proposed management model, schools are the center of relevance, not only for data recording, but fundamentally for the analysis of integrated information from their institutions that supports daily management and allows them, for example, to compare their indicators with similar institutions in their area. This new approach to school management must be supported through the availability of technological equipment suitable for the institutions, which will be a distinctive and motivating element of the new management model. Teacher ICT skills could also be fostered at the pre-service training stage. The organization of local workshops for teachers is also an adequate way to foster use of the EMIS at the school level.

It will always be necessary to have an operational plan in place for change management, which after approval should be widely disseminated. This plan should be measured and adjusted throughout its execution based on feedback from the actions that are implemented.

As for the central and regional administration, in addition to focusing on the explanation of the new procedures and systems, it would be advisable to emphasize the benefits that each MOEYI Unit will gain from this change. Large administrations such as education ministries are often resistant to change in the way activities are performed. As administrative personnel look at the positive results brought by the improved processes and their impact on efficiency, they most often become the drivers of the proposed changes.

As for the management staff, it is critical to highlight what information is made available through the enhanced EMIS and how it can be accessed. Focus should be placed on use of executive information system (statistical data warehouse, dashboards and RBM platform) to support decision-making and enhance monitoring and evaluation capacities. For this group and the senior management group, it is recommended to carry out a brief survey in order to determine skills in specific areas pertaining to management, planning and administration of resources. Specific professional workshops could then be proposed to strengthen those skills, as a complement to specific training in the use of the new EMIS platform.

Change management activities require a significant amount of resources but are fundamental for successful optimization of MOEYI management processes. Not implementing them would pose a significant risk of failure of the proposed strengthening plan.

8 CONCLUSIONS

The EMIS of Jamaica's MOEYI is at the turning point of its transition from a census-based management system to a fully transactional management system allowing for real-time monitoring and management of education system components. According to the methodology of this study, Jamaica's EMIS system is in the Incipient stage (2), like the majority of the 16 educational systems in Latin America and the Caribbean where the IDB Education Division has applied this EMIS diagnosis methodology[20].

There are two key aspects for the successful implementation of the EMIS strengthening plan that this analysis proposes: (a) establishing a strong governance system; (b) designing and implementing a change management plan that creates value and engages different stakeholders in this process.

The structural condition of Governance (8) is at an incipient stage, mainly due to the fact that the MOEYI is still in the process of integrating the national e-governance framework into its policies and plans. The critical element is the absence of a strategic plan to drive EMIS change.

With regard to technological infrastructure, pre-requisites are in place to sustain improvement of the EMIS. Although there is no technological obsolescence observed in central infrastructure, it will probably be necessary to resize the data center infrastructure when implementing the recommended solution. In this context, significant capital investments would be necessary. It is thus recommended to consider the migration of the central infrastructure to a private or national cloud scheme to host the EMIS platform. Another element is the provision of adequate levels of connectivity and technology for use of the EMIS in schools.

In terms of technical solutions, there is a growing issue of interoperability of the systems serving the internal sub-processes of each management area. There are a significant number of computer applications which are not integrated together and generally do not cover all the demand for information and management of central and regional administration as well as the information needs of schools.

The processes of human, financial and budgetary resources stand out with the highest percentage of subprocesses in the Established level, although significant efforts are still required to bring sub-processes lagging behind to emergent and established stages.

Physical infrastructure and equipment is the process with the lowest level of development, with 57% of its subprocesses classified as Latent. Digital content for teacher training and students' learning follows with an incipient state of development, with 43% of its subprocesses classified as Latent and 36% as Incipient. Both elements should be given particular attention.

20 The 16 education systems correspond to: Mendoza, Argentina; Córdoba, Argentina; Santa Fe, Argentina; Espírito Santo, Brazil; Florianópolis, Brazil; Bogotá, Colombia; Costa Rica; El Salvador; Honduras; Jamaica; Panama; Paraguay; Peru; Dominican Republic; Suriname; Uruguay (Council for Early and Primary Education).

The study also highlighted the need to provide a comprehensive solution serving schools and School Boards, which are the cross-cutting actors across all EMIS processes impacting education delivery. Institutions currently record multiple data in isolated systems and spreadsheets (often repeatedly), but do not have solutions that cover their management needs.

Strategic decisions need to be taken with regard to systems supporting the management of students and learning. The transition from the NSRS to the ESMS should be carefully studied in terms of feasibility and adequateness with required needs.

While transitioning from a census-based approach to a more complex real-time transactional approach, the MOEYI should still consolidate its annual school census and consider it as an integral component of its national EMIS. The school census operations and the scope of education statistics it produces will benefit from the availability of transactional data and from enhancement of each management process reviewed in this study. The MOEYI should also further strengthen strategic management by offering interactive data visualization and results-based management tools at all administrative levels.

The general conclusion is that careful attention should be given to the identification of a target EMIS model able to support all management processes in an integrated way and to develop a realistic implementation strategy to enable its deployment. The need for a new integral solution for the MOEYI appears to be relevant to the objective of achieving a high impact EMIS. The ESMS solution currently developed by the MOEYI could be considered as one of the first building blocks for the new management model but certain adjustments in its scope are necessary to guarantee deployment of an integral solution, taking into account all management processes under the EMIS. These management processes are conceptually based on these fundamental pillars:

- **Single record of school buildings:** it is defined as the only repository of all the data referring to the school environment of the educational system, considering the physical building in terms of its structure of environments, the dimensions of each environment, the movable and immovable property, equipment and services available. In addition, the different building interventions would be kept in this register.

- **Unique register of students,** for the nominal management of students, including in a single repository the personal data of the student, academics, social assistance received, online registrations, course and division attended.

- **Unique personnel register,** as a repository of all the data that make up the characterization and performance of each teacher, aspirant or worker in the educational system. This includes their personal data, the positions they hold, their medical history, salary settlement data, professional background, all kinds of new work and external evaluations. This registry would be the only source for the monthly settlement of teachers' salaries and would be associated with the single registry of positions, which would in turn be related to the budget.

- **Unique registry of positions,** with budget associated to each position, including a unique identifier that allows associating this element to the person who occupies it in an exclusive way. In the case of replacements, the absence of the person occupying each position should always be validated and then associated. The sum of the unique positions will be the total budget of available positions and will act as a limit of the expense.

With this model, schools will not only be able to improve their administrative operations but will also better meet the pedagogical demand. For example, teachers will be able to identify students at risk of dropping out (due to patterns of absences) and students lagging behind, and thus "adapt" their teaching-learning scheme. This model is applied in the proposed high impact EMIS in an integral way for all schools. For private schools that have their own solutions, they would be offered an interoperability interface, so that on a frequency established by the MOEYI, they could transfer the information required.

The effort will be significant and for some sectors of the MOEYI, particularly those that believe that their "information needs are satisfied", it could be considered unnecessary, but not doing so would imply investing resources indefinitely in limited systems, which are not conceived in an integral manner, and which have severe difficulties to deliver information relevant for the management of schools and monitoring of education delivery.

9 ANNEXES

9.1 Detailed Classification

MANAGEMENT OF PHYSICAL INFRASTRUCTURE AND EQUIPMENT General Score of the Process: Latent		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They implement the model of unique identification of school buildings.	Latent (1)	Jamaica does not have a unique identifier for school buildings. The annual school census is the main source of information about physical infrastructure and equipment in schools. Management and maintenance processes are paper based, with limited consolidation of the information at central level using Excel sheets.
They have a unique register of buildings in digital format that they use in the daily management of educational centres.	Latent (1)	No, Jamaica is not yet managing a directory of uniquely identified school physical infrastructure and buildings.
They have georeferenced school buildings.	Latent (1)	No. All schools were georeferenced in the past 5 years, but not the buildings.
The schools that operate on a shift basis in each building are recorded.	Latent (1)	No. Shift information is kept at the level of schools and not linked to building information.
The state of conservation of the buildings is recorded in the EMIS.	Incipient (2)	Information about the number of buildings by state of conservation is captured by the Annual School Census questionnaire. Buildings are classified in three categories (in good condition, needing minor repairs, needing major repairs), without instructions on how to classify buildings.
They record data on basic services (electricity, water, gas, telephone, internet, etc.).	Emergent (3)	Information about basic services in schools is captured by the Annual School Census questionnaire. Coverage of the private sector remains poor.
The classrooms that operate for each school are accurately recorded.	Incipient (2)	Information about number of classrooms by school is captured by the Annual School Census questionnaire. Coverage of the private sector remains poor.
The EMIS has the necessary and timely information to measure the congruence between the supply of physical infrastructure and the demand for educational services.	Emergent (3)	The MOEYI uses the Annual School Census enrollment and school capacity information as well as general population projections from the Statistical Institute of Statistics to analyze supply/demand for infrastructure. There is evidence of the Planning and Development Division using GIS (ArcGIS) to conduct catchment area analysis for school planning.
Inventory information is recorded and kept up to date		Information is partially captured by the Annual School Census.
Inventory information (desks, chairs, slates, dining room items, etc.) is recorded and kept up to date.	Latent (1)	Information is partially captured by the Annual School Census. There is no digital inventory register for movable properties.

MANAGEMENT OF PHYSICAL INFRASTRUCTURE AND EQUIPMENT General Score of the Process: Latent		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
Inventory information is recorded and kept up to date (physics, chemistry, biology, computer laboratories, etc.).	Latent (1)	Information is partially captured by the Annual School Census. There is no digital inventory register for specialized pedagogical equipment.
They implement a procedure for the management of the demand for emergency maintenance of buildings by means of an EMIS.	Latent (1)	No, the demand for emergency maintenance of buildings is managed manually using paper forms.
There is a procedure for scheduled maintenance of buildings through EMIS, with scheduled inspection routes and repairs.	Emergent (3)	Regional officers normally visit schools every 5 years to assess the maintenance needs of buildings. A procedure also exists for schools to send paper-based requests for maintenance. All those processes are, however, not recorded in EMIS.
The various building interventions are digitally recorded in the building register (with date, project executed, investment, contractor company).	Incipient (2)	Information about building repair intervention is kept in a paper format, sometimes recorded on Excel datasheets but not systematically.
They have information in real time and accurate data managed in a single register of buildings, with views and privileges associated with the various actors of the education system (Director, Supervisor, Director of Level, Administrative Areas, Political Leadership Level).	Latent (1)	No. Information is computed manually when requested.

MANAGEMENT OF SCHOOLS General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
Schools are managed by means of a unique school identification code	Emergent (3)	The MOEYI Planning Unit attributes a unique identification to all public and private primary, secondary and tertiary educational institutions. The code consists of 5 digits: two digits for the Parish ID and 3 sequential digits (1 digit distinguishes private and public institutions). When a school is closed, its school code is locked to prevent historical code duplication. The Early Childhood Commission (ECC) is in charge of infant school registration. It assigns a unique ID to infant schools. ECC identifiers could overlap at times with the code numbers assigned by the MOEYI (e.g. for a school with an infant program).
All information and management systems use the school's unique identification code.	Emergent (3)	Yes. All MOEYI applications use the unique identifier attributed to schools by the MOEYI Planning Unit, even if they could be using their own code and rely on correspondences between (different) codes of each system to manage the data

MANAGEMENT OF SCHOOLS General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They implement a comprehensive management based on a Single Register of educational centers where all the data of each school is found.	Emergent (3)	Yes. There is evidence of availability and use of a comprehensive school register. The register is managed centrally by the Planning Unit but is not yet used for the day to day management of schools by all MOEYI Divisions. ESMS is an attempt to improve this subprocess.
The system implements and manages curricula, position structures and reflects their changing dynamics, linking them to different sections or groups of students.	Emergent (3)	The Annual School Census database captures basic curricula information such as list of grades every year. The information remains partial as it does not include content structure of the curricula. It is not used for the day-to-day management of schools. ESMS is an attempt to improve this subprocess.
The system enables assignment of the curriculum offerings to an institution, scheduling of each subject/ position (scheduling), with the assignment of the teacher in charge and the students assigned.	Latent (1)	The EMIS does not offer scheduling capabilities for schools. Timetables and schedules guidelines are given to schools who manage their own records manually. Record of time planning stays at the level of schools. Annual School Census database does not collect teachers' assignments to sections and groups of students. ESMS is an attempt to improve this subprocess.
They implement a centralized management of educational offerings in schools, systematizing the evolutionary history of position structures, curricula and services that are provided and eventually liquidated.	Latent (1)	The Annual School Census provides a snapshot of educational offerings every year (as of October). Evolutionary history of educational offerings can be rebuilt from annual School Census datasets but is not available directly as a feature in the EMIS.
The EMIS has digitized information for the management of grouping of students in shifts, sections, criteria for categorizing schools and regulations regarding the minimum spaces required per student per classroom.	Incipient (2)	Yes, there is a partial digital record of student grouping in schools. The annual school census provides statistical figures about shifts and number of students by grade. Student grouping in sections is recorded in the NSRS system from grade 1 to grade 6 only. Number of available seats per school is not recorded.
They record which school operates in which building.	Latent (1)	Each school has its own facilities. Although school census captures information about number of buildings in each school, it is not possible to precisely know which building is used since there is no unique identification of school physical infrastructures.
They accurately identify school occupancy shifts in the building.	Incipient (2)	Shift information is captured by the annual school census but since there is no unique identification of school physical infrastructures, it is not possible to precisely identify building occupancy.
The management of monthly transfers for expenses managed by schools is systematized.	Latent (1)	This information is managed by the finance division and recorded in the recently deployed GFMIS. Allocations are calculated per capita.
They implement an immediate emergency assistance fund in schools (FIA) through the EMIS.	Latent (1)	No, this is not available in the current EMIS as the MOEYI does not implement such a fund at the school level.
Information related to educational material received by the school from the provincial or national state is recorded and kept up to date, for example: school supplies, textbooks, didactic material (pencils, notebooks, etc.), school uniforms.	Incipient (2)	Information is not systematically recorded and not available centrally. Schools have their own paper-based assets registries. The Media Services Unit keeps track of textbook distribution to public schools through a dedicated application (Textbook Management System)

MANAGEMENT OF SCHOOLS General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
The system delivers information in real time, from the data managed in the single register of schools, with views and privileges associated with the various actors of the education system (Director, Supervisor, Director of Level, Administrative Areas, Political Leadership Level).	Latent (1)	No. There is no integrated system that manages all the information from the single register of schools and delivers information by roles. The only sources of information are the statistical publications published by the Planning Unit. Additional statistical reports can be requested by demand. ESMS is an attempt to solve this.

MANAGEMENT OF HUMAN, FINANCIAL AND BUDGETARY RESOURCES General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
A unique model is implemented for the identification of positions in the education system and their association with the budget.	Emergent (3)	Yes. Position codes are attributed by the MOFPS and linked to budget items/lines. Each school has a list of positions recorded in OrangeHR system. The system is, however, unable to track when the position was created.
A unique model for identifying people in the education system and associating them with the budget is implemented.	Latent (2)	Personnel contracted by the MOEYI are all recorded in the OrangeHR Application. Every staff is registered using Tax Number as unique ID. The system keeps track of employment record history. HR thematic records can be managed by different units (such as JTC for teacher's registration), leading to some duplication and potential data quality issues. Temporary recruitments managed by schools are only reported through Annual School Census.
A unique record of HR in digital format is used in the daily management of these resources which includes complete personal data and family group, dependents, contact data, service data, special assignment to tasks other than service, medical history, special bonuses, links, affiliations, liquidation history, background for automatic appraisal in contests.	Incipient (2)	HR thematic records are scattered across different units (such as JTC for teacher's registration and professional development), leading to some duplication and potential data quality issues.
They have systematized processes for budget administration that allow budgets to be defined by schools.	Established (4)	Yes, they have a systematized process for the budgetary administration of school that is used throughout the education system. School budgets are allocated at regional level. Schools are keeping track of their spending manually, with control from the School Board. Processes are in place for budgetary administration of schools.
The estimation of teaching and non-teaching positions requirements in schools is strictly based on the demand for enrolled students.	Incipient (2)	Demand is the main factor to define position requirements in schools. However, in public institutions, positions remain in school even if a decline in enrollments is observed: Given that the school board is the hiring agent, the teacher cannot be transferred if s/he does not want to and even if his/her position is not needed anymore.
The management of medical and administrative replacements is systematized.	Incipient (2)	Teachers make the request to the School Board which submits the request to regional level for approval. If a school needs a replacement, it can request one (if more than a month). School Board fires the replacement (with approval from central). ESMS is an attempt to solve this.

MANAGEMENT OF HUMAN, FINANCIAL AND BUDGETARY RESOURCES General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
Automatically register and validate HR hires.	Incipient (2)	There is an attempt to automatically manage teacher registration through JTC. Validation of HR hires is systematic, based on minimum level of qualification required for the position.
The unique personnel record has a history of training and positions.	Emergent (3)	History of personnel positions is stored in OrangeHR, while training history is recorded in the JTC database. Both systems use the same Tax Number as unique identifier for HR records. The JTC database is not yet covering all teachers. Non-teaching staff training records are handled in OrangeHR, but not systematically.
Salary settlements are based on information from the personnel register and the budget module, and these are the only inputs.	Established (4)	Yes. OrangeHR records are used to calculate salary levels. The calculation and payment processes are externalized to IBM.
Teachers have the possibility to consult their own teaching record on the Internet, with appropriate security restrictions.	Incipient (2)	Personnel can access their HR record on demand but there is no web portal designed for this purpose. JTC database will offer this service to list pre-service and in-service teacher training records only.
They implement a periodic electronic and online register (at least every six months) for the evaluation of the school environment, with the level of satisfaction of the teachers.	Incipient (2)	This information is partially captured during school visits/inspections carried out by the National Education Inspectorate (NEI). Teacher's level of satisfaction is measured at least every 6 months. The NEI maintains its own separate database.
Results of external evaluations of teachers, whether provincial or national are recorded and managed.	Latent (1)	Evaluation is only internal.
Deliver accurate and real-time information of all data recorded in the Personnel Register such as total number of occupied and vacant positions, scales of substitution by type of function, current and historical services of agents, medical history and absences, with views and privileges associated with the managers of the educational system (Director, Supervisor, Director of Level, Administrative Areas, Political Leadership Level).	Incipient (2)	Relevant actors have limited access to some information from the personnel/staff register.

MANAGEMENT OF STUDENTS AND LEARNING General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They use the unique School-Study Plan-Section-Student identification model to identify the school, curriculum, and section each student belongs to.	Incipient (2)	Not all students have a unique identifier as this identification system is only partially implemented in NRS up to grade 6. Aggregated information about number of students by grade, programmes and sections by school is produced on a yearly basis through the school census but this tool does not record nominative information. ESMS attempts to solve this. School Information Systems used by large private schools often contain this information, but it is not normalized across schools, not enabling the ministry to use it.
They use the unique School-Study Plan-Student-Student Section identification model to manage the opening and closing of positions based on demand.	Incipient (2)	Section opening/closing is initiated at school level by the school principal based on previous year enrollment data (student registration book) and new admission requests received within the year. When approved by the school board and depending on the position type (temporary/permanent; public/private sector), a recommendation is eventually sent to the regional and central levels for approval.
They have a unique register of students in digital format that they use in daily management, with relevant data.	Incipient (2)	They have partial single records or several scattered records in digital format. The NSRS is the largest system in terms of number of students registered and scope of student level information captured. However, the NSRS only covers public primary schools. Information such as details about the curriculum taken by the student, absenteeism and behavior data is not recorded in the NSRS. The ESMS is supposed to enable recording of this information. Private schools are recording student information in their own system.
Use student information from the single registry to generate information required by other public or international bodies on a regular basis.	Incipient (2)	Since the NSRS is only capturing student level information for public primary schools, it is rarely used as the main source of information to satisfy the demand of external institutions. Figures from the school census are used instead. For example, school census data is shared with the Ministry of Finance for budget allocation to schools.
Use student information from the single registry to issue certification of studies, pass records, exams, and processing of promotion and repetition novelties through the system.	Incipient (2)	While information is partially available in NSRS, it is not systematically used for issuance of certificates.
Follow up of the students by means of individualized digital report (notebook) with this basic data.	Incipient (2)	See details below.
Registration of Attendances /non-attendance and Delays	Incipient (2)	Public schools capture this information on a monthly basis in paper format and submit quarterly reports to REOs. Private schools often have a school management system with digital records about student attendance.
Recording Appraisals	Incipient (2)	This information is only recorded digitally for grades 6 and 7 in public schools. Private schools often have a school management system to record student appraisals.

MANAGEMENT OF STUDENTS AND LEARNING General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
Behavior record	Incipient (2)	This information is not recorded digitally in public schools. Private schools often have a school management system storing this information.
Registration of promotion and repetition.	Incipient (2)	This information is recorded digitally in public schools up to grade 7, then available as aggregated data from the school census. Private schools often have a school management system storing this information.
The individual student report is in digital format.	Incipient (2)	This information is not recorded digitally in public schools, except for Grade 6 and Grade 7 (GSAT/PEP results data). Private schools often have their own school management system storing this information.
Implement systematized records related to the school environment, such as: bullying cases, in-school safety, semiannual student satisfaction level record, and periodic parental satisfaction level record (at least semiannually)	Incipient (2)	Records are not in a digital format. Incident reports are paper based and can be downloaded from the National Education Inspectorate (NEI) website. Prior to a school inspection, NEI asks the school to distribute satisfaction questionnaires to the parents. This information is used at the time of the school inspection, but not systematically digitalized.
They implement a module for the issuance of degrees, certificates and diplomas, with their corresponding registration in a central system.	Incipient (2)	There is no central and systematized process for issuance and registration of degrees, certificates and diplomas. CXC end of secondary exam results are systematically recorded by the Caribbean Examination Council.
They manage the results of external student assessments, whether provincial or national, and use this information as feedback for educational practices and policies.	Established (4)	Yes. The Planning and Development Division analyses CXC examination results data to inform policies. The analysis is done at the national level only. Schools have the ability to access the CXC portal to see their results and compare them with national trends: For national exams, there is a reporting mechanism in place enabling schools to assess how they perform compared to Parish and national averages.
They have an online registration and enrolment management procedure.	Incipient (2)	The process is manual and is done at each school. Student registration is done using NSRS student registration forms which are later digitalized in the NSRS database by REOs. However, this digital registration process is not covering all grades. Some schools also implement their own system and there is no integrated MOEYI system for this sub-process.
The EMIS has all the necessary information to carry out a systematized assignment of students to schools, in accordance with local legislation.	Latent (1)	The process is done manually in each school.
They implement a systematized procedure for the management per student of school feeding.	Emergent (3)	Quarterly reports are sent by schools to the MOEYI School Feeding Unit on enrollments. Students who are part of the PATH programme get access to free meals and corresponding budget is transferred to schools.
Implement a systematized procedure for student level management of school transport.	Latent (1)	No. There is no systematized process or digital record of transportation services provided to students. A pilot was done during the past few years for provision of transportation services to 7500 students registered in 266 rural high schools.

MANAGEMENT OF STUDENTS AND LEARNING General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
Perform a procedure for the management of scholarships per student in the scope of the system.	Incipient (2)	Scholarships consist of packages offered by private sector and MOEYI grants. Allocation is based on student performance and socio-economic status. Scholarship recipient information is captured in the ERDM database (type, amount, duration). Tertiary institutions also offer scholarship schemes which are often managed in Excel.
Provide online information to parents and guardians of the updated student record.	Incipient (2)	This feature is not available for students enrolled in public schools. Student records can be accessed online in secondary and private schools equipped with a school management system offering this feature (ex: RenWeb).
Deliver accurate, real-time information on all data recorded in the single student record with views and privileges associated with education system managers (Director, Supervisor, Level Director, Administrative Areas, Political Leadership Level).	Incipient (2)	Public Schools and relevant MOEYI stakeholders have real-time access to student level records stored in the NSRS.

MANAGEMENT OF DIGITAL CONTENTS FOR LEARNING AND PROFESSIONAL DEVELOPMENT General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They implement an annual professional development plan for teachers, based on new curricular demands and student learning challenges, with guaranteed access to it, regardless of the teacher's place of residence.	Established (4)	The MOEYI has a teacher training plan based on the needs of the curriculum, and it covers all teachers regardless of their geographical dispersion. Teachers have 3 days per year allocated to professional development. Training workshops are mostly conducted at the school level with master teachers. In-service professional development is completed with summer courses.
They implement digital support and monitoring tools for the teachers' professional development plan carried out by the education system.	Latent (1)	Information on teacher professional development is mainly recorded on paper. It is not integrated with the teacher registry and is kept separate from HR files.
Teachers have access to digital content for their professional development and this content is incorporated into Learning Management Systems (LMS) tools.	Incipient (2)	The MOEYI has a partnership with the British Council and OASIS Virtual Campus (like edX) for provision of online courses and programmes for teachers. Content is freely accessible for consultation. Payment is required for obtainment of a certificate.
Implement tools to support and monitor student learning and skills development.	Incipient (2)	See details below:
Implement learning platforms (mathematics, reading, languages, virtual laboratories).	Incipient (2)	Some online platforms are available, such as PEP for grades 4, 5 and 6.
Implement distance learning tools (LMS).	Incipient (2)	Some online platforms are available, such as PEP for grades 4, 5 and 6.

MANAGEMENT OF DIGITAL CONTENTS FOR LEARNING AND PROFESSIONAL DEVELOPMENT General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They implement a virtual tutoring scheme (asynchronous and/or synchronous teaching) that is transversal, understood as a support action for specific subjects of the students' curricula in which learning difficulties are detected (according to pedagogical indicators).	Latent (1)	The MOEYI does not perform any kind of virtual tutoring at the moment.
They have an area that defines guidelines and uses technologies for the generation and use of digital resources for the formation of learning and skills of students.	Emergent (3)	An E-content committee was established in the MOEYI Media Service Unit to review and approve electronic contents which could be procured. The committee consists of curriculum specialists. Private publishers and individuals can propose contents for online publication.
Train teachers in the use and generation of digital content for the formation of student learning and skills.	Incipient (2)	The JTC is currently reviewing a programme to form part of the certification and appraisal of teachers, that is being developed in conjunction with the UTech's Faculty of Education and Liberal Arts. Collaboration is also being sought with e-Learning Jamaica, which trains teachers in the use of ICT for learning. Through the "e-learning programme", basic ICT training is provided for secondary school teachers on how to develop digital contents.
Promote the generation of digital resources used for the formation of learning and skills of students from schools.	Latent (1)	There is no type of promotion/encouragement for the publication of innovative pedagogical experiences developed in schools. Government wants to include this criterion in teachers' assessment.
They encourage the publication of innovative pedagogical experiences developed in schools in terms of digital pedagogical resources used for the formation of student learning and skills.	Latent (1)	There is no type of promotion/encouragement for the publication of innovative pedagogical experiences developed in schools.
They have acquired packages of digital resource repositories to support curricular training from specialized publishers and use these resources.	Emergent (3)	The MOEYI purchased access to some packages of specialized digital resources to support curricular training, even if they do not use it throughout the education system.
They have an established process for the management of digital content, which provides virtual monitoring from the process of generation, analysis of the resource, use of content, evaluation and subsequent publication of it.	Incipient (2)	Regional officers normally visit schools every 5 years to assess the maintenance needs of buildings. A procedure also exists for schools to send paper-based requests for maintenance. All those processes are, however, not recorded in EMIS.
They have a central repository with a powerful search engine with classification of digital resources by educational level, modality, type of resource and area.	Incipient (2)	Information about building repair intervention is kept in a paper format, sometimes recorded on Excel datasheets but not systematically.
They provide information related to the background of digital teacher training and the incorporation of this information into the corresponding single register.	Latent (1)	This information is not tracked.

MANAGEMENT OF DIGITAL CONTENTS FOR LEARNING AND PROFESSIONAL DEVELOPMENT General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They provide information related to students' digital education records and the incorporation of this information into the corresponding single register.	Latent (1)	This information is not tracked.

TOOLS FOR STRATEGIC MANAGEMENT General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They implement business intelligence (BI) tools that provide online information through dashboards.	Incipient (2)	All data processing and data analysis is done using Excel and SPSS software.
They generate dashboards with updated and consolidated information on management indicators.	Latent (1)	See details below:
They implement teacher performance evaluation measurement boards.	Latent (1)	The MOEYI does not generate systematic statistical information, although data is available.
They implement dashboards with measurements of positions (occupied, vacancies, etc.).	Latent (1)	The MOEYI does not generate statistical information on the subject, although data is available.
They implement medical and administrative absenteeism measurement dashboards.	Incipient (2)	The MOEYI generates basic statistical information based on Annual School Census and from NSRS data.
They implement replacement measurement boards with double and single disbursement	Latent (1)	The MOEYI does not generate statistical information.
They implement wage expense measurement dashboards.	Latent (1)	The MOEYI does not generate wage expense measurement dashboards.
They implement dashboards with measurements of student-positions Relationships.	Incipient (2)	The MOEYI generates indicators on student/teaching-nonteaching positions such as Pupil teacher ratio. However, this information is not summarized on dashboards.
They implement dashboards with measurements of occupation of school buildings.	Latent (1)	The MOEYI does not generate such dashboards.
They implement dashboards with measures of total investment per school vs. academic performance.	Latent (1)	The MOEYI does not generate such dashboards.
They implement dashboards with measurements of investments in assistance services (transport, food, scholarships).	Latent (1)	The MOEYI does not generate such dashboards.

TOOLS FOR STRATEGIC MANAGEMENT General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They generate dashboards with updated and consolidated information on student performance and profile.	Emergent (3)	See details below:
They generate dashboards with school progression (repetition, drop-out, promotion, about age, others).	Emergent (3)	The MOEYI publishes a set of statistical tables with this indicator, even if the process is not automated.
They generate dashboards with results in standardized subnational, national, international and regional tests.	Emergent (3)	The MOEYI publishes a set of statistical tables with this indicator, even if the process is not automated.
They generate dashboards with academic results.	Incipient (2)	They generate some kind of related indicator. CXC results are published and disseminated. Data is shared in tables and listings.
They generate dashboards on the learning context: school climate/environment or student well-being.	Latent (1)	They generate some kind of related indicator.
They generate boards with other competences, such as citizenship, digital (ICILS) or socio-emotional profiles.	Latent (1)	The MOEYI does not generate such dashboards.
They generate dashboards with indicators from sources outside the education system.	Emergent (3)	The MOEYI computes classical NER/GER indicators which require access to general population census data source.
The system calculates some synthetic indicator of educational quality at the school level.	Emergent (3)	The MOEYI computes and publishes classical quality proxy indicators such as Pupil Teacher ratio, attendance rate or school occupancy ratio. Data is published online in PDF school profiles.
The system allows for the generation/visualization of individual or combined student performance indicators for different levels, and allows comparison at the section, school, supervisory circuit, region, or administrative headquarters level and over time.	Latent (1)	The MOEYI publishes student results in printed/pdf reports.
Do they consolidate information only from public schools or do they also integrate information from the private sector or in concession?	Emergent (3)	The MOEYI consolidates information from the entire education system, including the private sector and subsidized/concessional schools. However, the MOEYI faces issues of coverage of the private sector. This is especially true in the dynamic pre-primary education sub-sector.
They have the human resources to design, produce, analyze and disseminate dashboards.	Emergent (3)	Current human resources consist of statisticians and education planners with good knowledge of education statistics. However, capacities remain limited for use of advanced data analysis and processing techniques, as well as non-existent for the preparation of visual dashboards. Human Resources could be trained in that regard.

TOOLS FOR STRATEGIC MANAGEMENT General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
The available dashboards are effectively used for decision making and school management.	Incipient (2)	The MOEYI statistical publications, although not published in the form of dashboards, are used to inform some management processes. The scope of the available information remains, however, limited and management decisions often have to rely on ad-hoc data collections.
They have some implemented dashboards.	Latent (1)	They do not have any type of dashboard. The scope of the existing school profile publication could be expanded and data used to produce interactive dashboards comparing education offer and school performance across Jamaica.
They use appropriate tools to detect learning challenges or drop-out risks in a timely manner.	Latent (1)	They do not have any tool (e.g. software) to detect learning challenges or risks of drop-out in a timely manner.
The executive levels of management (ministries, regional directorates, schools, teachers) have been trained in the interpretation of dashboards.	Latent (1)	Executive levels are not able to analyze and interpret the indicators. They are not prepared to create their own dashboards from information cubes.
EMIS users can create their own dashboards.	Latent (1)	The EMIS does not offer dashboard features.
The data available on the dashboards can be updated both in reference to reporting time and format.	Latent (1)	The EMIS does not offer dashboard features.
They implement other quantitative measurement tools to direct and make decisions based on the objectives set by the management.	Incipient (2)	They generate some kind of qualitative measurement information to direct and make decisions based on the objectives set by the management.
The tools allow for an interpretation of the performance of the diverse processes, programs and projects of each EMIS level (school, supervisors, regional directors, directorates of level, etc.); identifying the deviations or variations with respect to the goals.	Incipient (2)	The tools allow some interpretation of the performance of the processes, programs and projects of the sector.
They provide information on the performance of the education system for civil society (parents, communities, oversight institutions).	Incipient (2)	Some information on the performance of the education system is provided to civil society at the aggregate level.

TECHNOLOGICAL INFRASTRUCTURE General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
Schools have connectivity to make use of administrative and pedagogical management systems.	Established (4)	Most schools are connected to the internet through telecom operators. Public schools use their budget to purchase connectivity plans. Level of connectivity is high, but quality is an issue (bandwidth and service interruptions) in many public schools, particularly in rural areas.
They have adequate connectivity for administrative and pedagogical management at central or district levels.	Established (4)	The levels of connectivity (internet or alternative network) for administrative and pedagogical management are high. All administrative and pedagogical areas have connectivity.
They have technological infrastructure (software and hardware) for the processes handled by an EMIS that meets the demand, with redundancy in the production environment.	Emergent (3)	EMIS components are hosted in a national datacenter as well as in the MOEYI. Main EMIS applications are hosted on redundant environments with daily backup.
They implement a development environment, a testing environment and a production environment with the appropriate infrastructure.	Emergent (3)	In addition to production environments, the MOEYI has testing and user acceptance test environments for applications developed externally. EMIS applications developed or maintained internally are not implementing this software development model.
They use an adequate procedure for safeguarding and restoring the information.	Emergent (3)	Yes, backup procedures are in place to safeguard the main EMIS datasets. Restoring procedures exist but are not regularly tested.
They implement automatic auditing processes on sensitive data that can be modified by system users.	Latent (1)	Basic security rules are in place in main EMIS applications. However, track change over datasets is not implemented systematically. They do not have any mechanism for auditing sensitive data that can be modified by users of the system.
They have updated technical documentation of the implemented information systems.	Incipient (2)	Technical documentation is not always available and is not up to date.
They have operational manuals (standardized work methodology).	Emergent (3)	Operational manuals exist for some EMIS components, but standard operating procedures are not always in place.
They have a suitable architecture and development tools.	Incipient (2)	The MOEYI has adapted technical infrastructure to the implementation of an EMIS. Some applications such as the Annual School Census run on non-mainstream and unscalable databases such as FoxPro.
They implement mechanisms for the management of "identity protection" understood as the set of authentication and online access technologies designed to provide users with robust security of a simple use for the identification of access to services and digital applications.	Incipient (2)	Although the MOEYI relies on adequate technologies such as user Single Sign-on for some of its EMIS applications, the MOEYI has some dispersed measures of identity authenticity protection for system users which are not standardized across EMIS sub-systems.
They implement cybersecurity management that includes: (a) data availability; (b) integrity and authenticity; and (c) confidentiality.	Incipient (2)	The MOEYI implements some scattered cybersecurity measures.

TECHNOLOGICAL INFRASTRUCTURE General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They have a policy of maintenance and technological support of an EMIS.	Latent (1)	The MOEYI does not have an established policy for maintenance and technological support.
The technologies area provides updated digital information on the progress of the projects.	Incipient (2)	Relevant stakeholders have some access to information (e.g. reports) from the technology area on the level of progress of the projects.
The various systems are integrated at data level.	Incipient (2)	There is some level of system integration at the data level such as exchange of shared unique identifiers between EMIS applications, but it remains insufficient.
The systems implemented are compatible and interoperable.	Latent (1)	EMIS components operate in silo with duplication of information. Systems are not all compatible and interoperable. The ESMS is an attempt to solve that.
The EMIS is integrated or interoperable with external systems (from other public entities within the same jurisdiction, from national entities to decentralized systems, from the private sector or from civil society).	Incipient (2)	No. While the NSRS includes verifications of student records with the civil registration database, the EMIS is not integrated with external systems such as civil registration database.

GOVERNANCE AND INSTITUTIONAL FRAMEWORK General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
There are established norms (laws, decrees, resolutions, dispositions, manuals) that regulate the key processes and the systems that support them, understanding this as: the aspects of the EMIS that are regulated, the existing regulations in the country for data management and security, the existing regulations in the country regarding technology in the public sector.	Emergent (3)	The Government of Jamaica has made the integration of information technology into the Jamaican economy a high priority and a strategic imperative[21]. Access to information Act and Data Protection Acts are currently debated, unfolding legislations on e-governance, data access, privacy, cybercrime and other subjects. An ICT in Education Policy exists along with a draft master plan for its implementation with information systems as a crosscutting dimension.
There is effective compliance with the rules established in the preceding paragraph.	Incipient (2)	The Master Plan for implementation of ICT Policy is still at a draft stage. Rules are reviewed but only partially implemented.
There are regulations that protect the privacy of the information contained in the EMIS and that regulate the use of them to ensure ethical use.	Emergent (3)	There are regulations that protect the privacy of the information contained in the EMIS and that regulate their use to guarantee ethical use, but they are implemented in a partial way.

21 See https://jis.gov.jm/govt-transforming-jamaica-into-digital-economy-pm/.

GOVERNANCE AND INSTITUTIONAL FRAMEWORK General score of the process: Incipient		
SUB-PROCESS	**SCORE**	**JUSTIFICATION**
They have a clear and strategic vision for the implementation or development of the information and management system (unique identifiers, process virtualization, systems modernization, integrated approach, etc.).	Emergent (3)	The MOEYI has a strategic vision for development of its EMIS articulated in its ICT in Education strategy. Technical and functional requirement documentation exists.
They have an EMIS strategic plan approved and supported by the highest authority of the educational system.	Incipient (2)	The MOEYI is preparing a roadmap for implementation of the ESMS. Other systems are also in rapid development, such as the JTC database, but are not integrated in the plan. The scope of the plan covers less than 50% of the processes and sub-processes.
They have the necessary human resources to improve EMIS in the short, medium and long term.	Incipient (2)	The MOEYI has limited qualified, trained human resources to develop and maintain all the EMIS applications.
They have the necessary financial resources to improve EMIS in the short, medium and long term.	Incipient (2)	There is no detailed cost estimate for building the envisioned EMIS. Limited financial resources are available, and resources are not necessarily budgeted long-term.
They have a plan for the management of the EMIS change.	Latent (1)	There is no plan in place to manage the EMIS transformation.

9.2 EMIS Instrument

The EMIS information gathering instrument for Jamaica is attached as annex document.[22]

9.3 Personnel Interviewed

NAME	ROLE/POSITION
Grace McLean	Permanent Secretary (Ag)
Barbara Scott	Advisor to the PS
Molly Jacas	SEO Manager, Implementation Unit
Coleen Clarke Russell	Education Officer, Core Curriculum Unit
Lorna Thompson	Education Officer, Core Curriculum Unit
Kerrith Watts	Senior Education Officer, Media Services Unit
Nadine Simms	Asst Chief Education Officer, Media Services Unit

22 The instrument can be found in this link: https://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=EZSHARE-2130847722-30/.

NAME	ROLE/POSITION
Maryah Ho-Young	Senior Education Officer, Student Assessment Unit
Charlene Robinson	Education Officer, Core Curriculum Unit
Tyrone Anderson	Director (Ag), Management Information Systems Unit
Kadine Jemmison Gordon	Coordinator, ESMS Unit
Dykes Farquharson	Statistics Unit, Planning Division
Anastasia Gordon-Jones	Legal Officer, Leal Services Unit
Viviene Johnson	Planning and Development Division
Tina Robinson	Executive Services Unit
Karlene Deslandes	Executive Director, Early Childhood Commission
Haydee Gordon	Director, Legal Services
Shirlee Morgan	National Education Inspectorate
Donna Robinson	Schools Personnel and Administration Services
Floyd Kelly	Regional Director (Ag), Region 1
Cassandra Anderson	National Education Trust
Carey Brown	Director, Technical Services (Infrastructure)
Melissa Zunan-McTavish	Educational Planning
Garth Gooden	Director, Procurement Unit
Dillette Hope-Webb	School Feeding Unit
Rhonette Pitter	National Student Registration System
Kasan Troupe	Deputy Chief Education Officer, School Operations
Richard Troupe	Director (Ag), Safety and Security in Schools Unit
Cheveta Rose	Orange RM
Nichole Brown Francis	Schools Personnel Unit
Marlene Hines	Xythos
Winsome Gordon	Director, Jamaica Teaching Council
Cedric Scott	Financial Controller
Nicole Brown	Planning Unit
Kemar Higgins	MIS Unit
Odaine James	Centre of Occupational Studies
Tamara Miller	Planning Division
Latoya Palmer	Permanent Secretary's Office
La-Toya Nesbitt	Principal (Ag), Allman Town Primary School
Colleen Montague	Principal, Wolmer's Girls School

9.4 Main Norms and Regulations for Data Management and Data Security

PROCESS	TOPIC	HIERARCHY (TYPE OF REGULATION)	NO/DATE	TITLE
Governance and institutional framework	E-governance	Government of Jamaica	March 2011	Information and Communications Technology (ICT) Policy
Governance and institutional framework	ICT in Education	MOEYI	June 2018	Information and Communication Technology in Education Policy
Governance and institutional framework	E-governance	Government of Jamaica	Draft	Access to information Act
Governance and institutional framework	E-governance	Government of Jamaica	Draft	Data Protection Acts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