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# REVIEW OF EDUCATION MANAGEMENT INFORMATION SYSTEMS (EMIS) THAT TRACK INDIVIDUAL STUDENT DATA **MALAYSIA**

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## Ministry of Education

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## United Nations Children’s Fund (UNICEF)

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UNICEF country offices manage and implement programmes supporting children’s rights through 14 offices in 28 countries, including 14 Pacific Island States throughout East Asia and the Pacific. UNICEF has supported various aspects of EMIS development in these countries, either directly or through collaboration. UNICEF has also supported numerous studies which either promote or use EMIS and EMIS data. For example, UNICEF has recently supported studies on out-of-school children<sup>1</sup> in 10 countries in the region, which relied heavily on EMIS and household survey data to help identify those children and their characteristics who are at risk of dropping out and who were out of school. The Out-of-School Children Initiative was a collaboration between the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics (UIS) and host governments.

At the regional level, UNICEF continues to address issues in the region relating to inequity by facilitating and supporting regional initiatives and partnerships, such as: the Asia-Pacific Thematic Working Group on Education 2030/Sustainable Development Goal 4, which

UNICEF co-chairs with UNESCO; Enhancing Statistical Capacity for Education, with UIS; the Association of Southeast Asian Nations (ASEAN) Declaration on Strengthening Out-of-School Children and Youth Working Group, with UNESCO; the East Asia and Pacific United Nations Girls’ Education Initiative, with multiple partners; the Asia-Pacific Regional Policy Forum on Early Childhood Care and Education; the Pacific Regional Forum for ECCE; and the Asia-Pacific Multilingual Education Working Group. All of these initiatives rely on accurate and timely data to help inform stakeholders of disparities and other issues within education throughout the region.<sup>2</sup>

Other initiatives encourage countries to seek improved methods of obtaining quantitative data on learners and to use data to influence policy and resource allocation. An example includes the development of a regional assessment: the Southeast Asia Primary Learning Metrics,<sup>3</sup> in collaboration with the Southeast Asian Ministers of Education Organization and the Australian Council for Educational Research, to ensure greater focus on learning (including global citizenship) in participating countries and to enable the comparison of learning standards across ASEAN.

1 Including Vietnam, Philippines, Indonesia, Cambodia, Thailand, Lao People’s Democratic Republic, Malaysia, Myanmar, Papua New Guinea, and Timor-Leste.

2 [www.unicef.org/UNICEF\\_EAPRO\\_Education\\_FINAL.pdf](http://www.unicef.org/UNICEF_EAPRO_Education_FINAL.pdf), accessed on 5 February 2019.

3 [www.seaplrm.org/seaplrm/](http://www.seaplrm.org/seaplrm/), accessed on 14 February 2019.

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## Definitions

**Administrative data:** All school and student data, including student management data, student learning data, school finance data, etc.

**EMIS:** An education management information system (EMIS) is a system that manages education information. In different contexts, the system may be referred to by a different name. An EMIS can manage a wide range of data, including: student information (demographics, enrolment, discipline, and other functional elements); instructional/learning information (assessment and achievement data, teacher evaluations, curriculum effectiveness data and other elements related to progression through school); longitudinal data; and business intelligence (financial and human resource data, strategic metrics, etc.).

**Local:** This refers to all the administrative subdivisions that fall under the sub-national level. For example, municipalities, counties, districts and, communes.

**Metadata:** A set of data that describes and gives information about other data.

**National:** This refers to the whole country. In the survey, the national level refers to legislation mandated by the central government.

**Sub-national:** This refers to the administrative level that immediately follows the national level. For example: states in India, Mexico and the US; provinces in Argentina, Indonesia, Thailand and Finland; regions in France; or zones in Nepal.

**Summative indicators:** Variables derived from individual-level data, such as administrative, financial, or human resources data.

# Acronyms

<b>Act 550</b>	The Education Act 1996
<b>APDM</b>	Aplikasi Pangkalan Data Murid
<b>ASEAN</b>	Association of Southeast Asian Nations
<b>e-Operasi</b>	E-Operation for Teachers
<b>EAPRO</b>	UNICEF East Asia and Pacific Regional Office
<b>EMIS</b>	Education management information system
<b>HRMIS</b>	Human resource management information system
<b>IC</b>	Identity card
<b>ICT</b>	Information and communications technology
<b>ISCED</b>	International Standard Classification of Education
<b>KPM Dashboard</b>	Kementerian Pendidikan Malaysia Dashboard
<b>MAMPU</b>	Malaysian Administrative Modernisation and Management Planning Unit
<b>MIS</b>	Management information system
<b>MyGOS</b>	Malaysian Government Online Services
<b>NKRA</b>	National Key Results Areas
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PAJSK</b>	Physical Activity, Sports and Co-curriculum Assessment
<b>PDSA</b>	Public Sector Data Centre
<b>SABER</b>	Systems Approach for Better Education Results
<b>SAPS</b>	School Examination Analysis System
<b>SDGs</b>	Sustainable Development Goals
<b>SDSN</b>	Sustainable Development Solutions Network
<b>SKPM</b>	Malaysian Education Standards and Quality
<b>SKPMg</b>	SKPM version 2.0
<b>SMIPS</b>	Private Education Information System
<b>SPPAT</b>	Online Examination Registration System
<b>SPM</b>	Malaysian Certificate of Education
<b>SPS</b>	System Pengurusan Sekolah
<b>SSDM</b>	The Student Character System
<b>UIS</b>	UNESCO Institute for Statistics
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNICEF</b>	United Nations Children's Fund

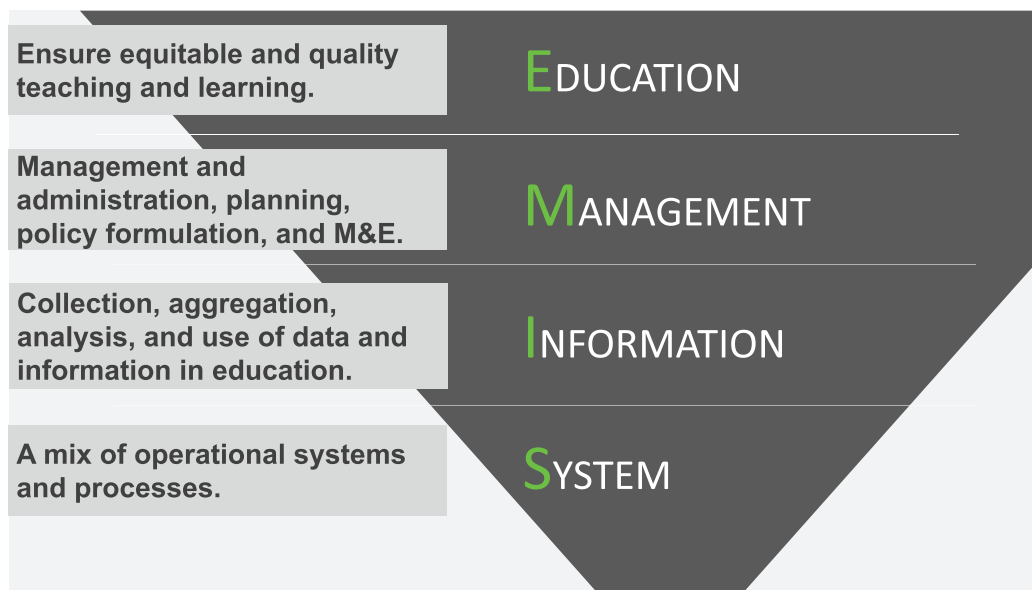




# Executive summary

This review of education management information systems (EMIS) in Malaysia has examined policy relating to, and the data gaps of, EMIS in the country, and has reviewed the extent to which data are analysed and utilised for decision-making by the Ministry of Education and other stakeholders. The review examined the EMIS in Malaysia and makes recommendations to ensure the Ministry of Education can capitalise on the potential of the EMIS as a facilitator of data-driven decision-making.

**Figure 1. EMIS conceptual diagram**



EMIS can be defined as a mix of operational systems and processes, increasingly supported by digital technology, that enable the collection, aggregation, analysis, and use of data and information in education, including for management and administration, planning, policy formulation, and monitoring and evaluation.

The study concluded that the EMIS ecosystem in Malaysia is comprised of a complex array of different systems. The EMIS ecosystem of Malaysia consists of 239 systems and applications at the pre-school to secondary levels, as well as 110 systems and applications at the post-secondary levels. These systems and applications are owned and managed by various divisions within the Ministry of Education. Despite having many different systems, the Ministry focuses on three main systems. These are: the Sistem Pengurusan Sekolah (SPS), which is a School Management Module that contains information about the schools; E-Operation for Teachers (e-Operasi), which is a teacher management system that contains individual data of teachers in the schools; and Aplikasi Pangkalan Data Murid (APDM), which is a Student Information System containing data

on individual students. In addition, there are systems and modules which are devoted to recording the attendance of students, their examination records, their participation in extra-curricular activities, and their character and wrongdoing, as well as those containing detailed information about teachers, the subjects they teach, and their daily whereabouts. There are also systems and applications dedicated to the inspection of schools, in the form of a school management tool, as well as those dedicated to the management of public examinations.

In 2017, an Education Data Repository was developed with the objective of consolidating the systems and data and beginning a process of the rationalisation of data recording and reporting. In 2019, 12 systems and applications are contained in the repository, which enables big data analytics, such as descriptive, diagnostic, predictive, and prescriptive analytics, to be carried out across the data gathered from these systems and applications simultaneously. The analysed data are presented through data visualisation and in tabular form through the Kementerian Pendidikan Malaysia

(KPM) Dashboard, which is used as an input for decision-making and policymaking and monitoring implementation at the national, state, and district levels.

At the end of 2018, the Ministry of Education launched a five-year Information Communication and Technology (ICT) Transformation Plan (2019–2023) aiming to transform the overall ICT structure and environment, of which the reform of the EMIS ecosystem is a major part. The Plan helps articulate changes to the architecture and strategy, decision-making, governance, organisational structure, personnel, support management, and implementation management of ICT systems. A total of 27 initiatives are proposed in the Plan: 11 of these initiatives are intended to address and improve on

fundamental issues and 16 initiatives are innovative, seeking to transform the ICT of the Ministry of Education. These initiatives are divided into three waves of implementation. Implementation of the Plan is currently at the first phase of carrying out the initiatives.

However, while the ICT Transformation Plan is comprehensive, it does not include all elements required to be reformed for the Ministry of Education to meet the needs of stakeholders at all levels of government. The analysis of the EMIS ecosystem provided in this report presents additional recommendations that can complement the reforms articulated in the ICT Transformation Plan.

## Conclusions

The ecosystem of different systems and applications in Malaysia is complex, with more than 200 systems and applications across all levels of education. These systems and applications are developed, owned, and managed by different divisions in the Ministry of Education, and as a result are not integrated and have limited interoperability. There is significant duplication of data and, in some cases, data do not align between systems. As a result of the systems having been developed at different times and by different vendors, substantial effort is expended in ensuring the systems can communicate with each other. Users are required to access different applications for different purposes. Data are not easily synchronised or shared between different systems and thus there are issues relating to data integrity.

The Ministry of Education has developed the Education Data Repository, which attempts to consolidate and bring together the major EMIS systems and applications. The Repository currently includes 12 of the main systems and applications. The systems are still separate but the Repository does enable them to share, analyse, and present data through a single information portal called the KPM Dashboard. The KPM Dashboard allows users at the ministry level to view and analyse data derived from the 12 systems. However, despite the capacity of the Repository to compare different data sources and to help provide insight into the education system, the KPM Dashboard is only accessible to the top management and key personnel within the Ministry of Education, including the State Education Officers

and District Education Officers. This is a key constraint to its utilisation at school level.

The Ministry of Education ICT Transformation Plan 2019–2023 was developed in 2018 and supports the Education Data Repository. The Plan proposes a single integrated platform that will enable data to be shared between all systems and applications, that will provide a single portal for access to Ministry of Education education data, and that will enable information to be available at national, divisional, district, and school levels. The Plan emphasises intra-ministry coordination led by the Information Management Division. However, the Plan is not clearly funded, and lack of financial resources constrains implementation of the Plan.

Presently, each division is allocated responsibility for the EMIS systems under its mandate. The operation and development budget required for each system is allocated from the operational budget of the responsible division. The Information Management Division allocates budget for the hardware and supporting software (such as security) required to host systems through the Education Data Repository. Therefore, it is difficult to coordinate the development of each EMIS system required under the vision outlined in the ICT Transformational Plan. It is also uncertain whether each division has a sufficient budget available to ensure the necessary changes to each system.

The systems store information on individual teachers and students, and are aligned with the national database of citizens. Legislation exists to protect the data on

individuals from commercial exploitation<sup>4</sup> but does not cover the use of individual data by government agencies. The Ministry of Education should develop a policy on the confidentiality of individual data. The individual student and staff data enable equity analysis to be undertaken. The systems manage daily attendance and transfers of students. The system also tracks teachers throughout their career and is used for most teacher management functions.

The data derived from the Education Data Repository are used to inform decision-making at the national, district, and divisional levels, such as the allocation of teachers, pedagogical materials, and facilities to schools. EMIS data are also the main source of statistical data within the Ministry of Education, and are used to monitor education plans and guide education policy and policy implementation. However, there is scope to improve the extent to which the EMIS is used in planning. Individual schools still need to write manually to the District Education Office to request teachers, facilities, or repairs. There are no automated warning systems, except for the infrastructure component in SPS, that can alert administrators at the sub-national levels to likely problems in schools.

At the school level, most of the systems and applications in the EMIS ecosystem are used for compliance and reporting purposes only. Compiling information on individual students requires head teachers to request data from each teacher responsible for data entry into each EMIS system. The head teacher must then manually compile all data, in order to form a picture of the student's background, achievements, and attendance. The integration of the systems under the Education Data Repository will help bring these data together under a single portal; however, it is essential that reports be developed for use by teachers and head teachers. This process has commenced with the recent capacity of the Repository to predict the risk of a student's dropping out of school based on a composite rating of seven indicators gathered from different systems and applications.<sup>5</sup> This function provides an early warning signal to teachers and head teachers about individual students who are likely to drop out, so that interventions can be made to prevent dropout.

Parents only have access to the School Examination Analysis System (SAPS), which contains the examination records of their child. The public and wider community have no access to information about schools, with the exception of being able to access aggregated national and state data published by the Ministry of Education in its annual statistics book. These data are not published in an appropriate format to have meaning for the community but this does help the media and public agencies to report on the education system. Disseminating data to schools, parents, and the wider community will help engage actors at the school level in supporting schools and addressing the needs of individual students. Many countries engage parents and the community through EMIS systems and data, and changes to the systems in Malaysia would enable the country to similarly engage stakeholders at the school and community level.

The Sustainable Development Goals (SDGs) are an important global agenda; however, there remain gaps in the data within Malaysia's EMIS ecosystem that need to be addressed in order to pursue the SDGs. It is necessary to review the systems to ensure they can capture and report on all SDG indicators. The Ministry of Education should work with the Department of Statistics at the Ministry of Education, and others, to align education (including SDG) data requirements in each household survey to ensure education data capture of SDG indicators are incorporated where feasible.

4 Under the Personal Data Protection Act 2010.

5 These include attendance, academic achievement, student character assessment, disability status, household income, distance from schools, and status of parents/family.





# Recommendations

The following recommendations are derived from this review.

**Table 1. Recommendations derived from this review**

Evaluation Question number	Recommendation	Priority (1 = urgent, 2=medium priority, 3=low priority)	Timeframe (2019 to 2024)	Resourcing	Responsibility	Reference to ICT Transformation Plan 2019–2023
<b>Strengthen the enabling environment</b>						
1.01.1	Ministry of Education should allocate sufficient annual funds for the ICT Transformation Plan and for the further development and operation of the EMIS. This will help ensure that development requirements are implemented, and the disparate systems are integrated and simplified.	1	2019–2023	Funding	Information Management Division	ICT Transformation Plan 2019–2023
1.02.1	Increase the number of software licences to enable the KPM dashboard to be deployed to districts and schools. One option is to use open licensed software, such as by exporting information to a MySQL database for reporting.					
1.08.03	Develop a policy on the protection of individuals' data for the Ministry of Education.	1	2020		Information Management Division	
1.09.1	Establish agreements with the Ministry of Health, Ministry of Women, Family and Community, Department of Social Welfare, and Department of Statistics for the purposes of sharing data between systems and applications on parental income and to accurately capture data on children with disabilities and applications that deal with child development.	1	2020–2023	Funding, technical expertise	Educational Policy and Research Division	

Evaluation Question number	Recommendation	Priority (1 = urgent, 2=medium priority, 3=low priority)	Timeframe (2019 to 2024)	Resourcing	Responsibility	Reference to ICT Transformation Plan 2019–2023
1.09.2	Develop data-sharing agreements with the Ministry of Human Resources, Department of Statistics, and others required for the purposes of sharing data between systems and applications that deal with adult lifelong education and training.	1	2020–2023	Funding, technical expertise	Educational Policy and Research Division	
1.11.1	Create a clerical/administrative assistant position in each school to help manage data across the EMIS systems and help reduce teachers' workload.	1	2020		Human Resource Division	
2.01.2	Develop a communication strategy for EMIS data which details how the Ministry can communicate data in the EMIS ecosystem to the media, public, and community stakeholders.	2	2021–2023	Budget	Corporate Communication Unit	
<b>Strengthen the EMIS system</b>						
1.02.2	Provide automated system alerts for key functions, such as to notify parents, teachers, and head teachers of student absenteeism, or to notify districts of shortages of teachers, facilities, and equipment.	1	2019–2020	Funding	Information Management Division, Educational Policy and Research Division, School Management Division, Malaysia Digital Economy Corporation (MDEC), Malaysian Administrative Modernisation and Management Planning Unit (MAMPU)	
1.03.1	Review the EMIS systems to ensure they are able to capture and report on all SDG indicators.	1	2021	Funding, technical expertise	Information Management Division, SDG Taskforce	

Evaluation Question number	Recommendation	Priority (1 = urgent, 2=medium priority, 3=low priority)	Timeframe (2019 to 2024)	Resourcing	Responsibility	Reference to ICT Transformation Plan 2019–2023
1.03.3	The Ministry of Education should work with the Department of Statistics and Ministry of Education, and others, to align education (including SDG) data requirements in each household survey to ensure education data capture requirements of SDG are incorporated where feasible.	1	2020	Funding, technical expertise	SDG Taskforce	
1.03.2	Develop methodologies to capture SDG indicators, through EMIS, on non-formal education, education for children with disabilities, and youth/adults in the Malaysian context.	1	2021	Funding, technical expertise	SDG Taskforce	
1.05.1	Ministry of Education should extend the coverage of APDM and other systems and applications to capture individual students in private schools and home schooling. This will help improve student tracking and data on out-of-school children.	1	2023	Funding, technical expertise	Information Management Division, School Management Division Private School Division, Educational Policy and Research Division	
1.06.1	Establish a common database and assign unique identifiers that are permanent for schools (school ID), teachers (National Registration Identity Card), and students (student ID), with common coding and data standards, as outlined in the ICT Transformation Plan; these will serve as the basic information to be extracted into all systems and applications, to avoid duplication and redundancy.	1	2019–2022	Technical expertise	Information Management Division, Educational Planning and Research Division (EPRD), School Management Division	
1.06.2	Develop common standards for the registration of students without documentation, either in the form of school ID + auto-generated student number or a 12-digit ID with the National Registration Department, rather than using birth certificate, passport number, or the reference number for paperwork relating to students.	1	2019–2022	Technical expertise	School Management Division	

Evaluation Question number	Recommendation	Priority (1 = urgent, 2=medium priority, 3=low priority)	Timeframe (2019 to 2024)	Resourcing	Responsibility	Reference to ICT Transformation Plan 2019–2023
1.04.1	Incorporate the first or home language of students in the Student Information System (APDM), in line with SDG4.5 as a student attribute. Also, incorporate data on bullying, corporal punishment etc. in line with SDG4.a to monitor and contribute to student well-being.	1	2021		School Management Division, SDG Taskforce	
1.04.3	The EMIS ecosystem should capture information on children who are learning through alternative modes of learning, such as children of migrant workers and illegal immigrants.	1	2020		School Management Division, SDG Taskforce, Private Education Division	
1.07.1	Enhance the overall interoperability of administrative data systems by integrating EMIS with the systems and applications in other ministries and agencies, including the Ministry of Health and the national birth registry, via a unique national identifier, in line with the ICT Transformation Plan, to help clean and verify data.	1	2019–2023	Funding	Respective divisions that own the systems and applications	
1.09.3	The Ministry of Education and other ministries should work jointly to develop a national registry of citizens that indicates the status of each citizen as regards the receipt of age-related essential services. This system should be searched at the service delivery point, such as the school or health facility, to ensure referral of any citizen not obtaining an essential service appropriate to their age. It can also be used for issues requiring special treatment, such as disability status.	3	2023	Funding, technical expertise	Educational Policy and Research Division, Special Education Division, Information Management Division	
1.08.1	Enhance parental and student access to the EMIS and provide a single login and passwords for parents for all Ministry of Education online services.	1	2021	Funding, technical expertise	Information Management Division	



Evaluation Question number	Recommendation	Priority (1 = urgent, 2=medium priority, 3=low priority)	Timeframe (2019 to 2024)	Resourcing	Responsibility	Reference to ICT Transformation Plan 2019–2023
2.06.1	Include the variables used for the calculation of school grants in APDM and related systems and applications, to allow the general assistance grant to be calculated, disbursed, and remitted directly, thus eliminating manual and duplicated work. This will require integrating the financial system used for the remittance of grants and assistance with the accounting module in SPS.	1	2023	Technical expertise	School Management Division, EPRD, Finance Division, Information Management Division	
2.07.1	Reduce the number of systems and applications that are intended for reporting and monitoring purposes, especially those which do not necessarily contribute to improving pedagogical outcomes.	2	2019–2023	Funding	Data owner, Information Management Division	
<b>Enhance EMIS use</b>						
1.02.1	Widen access to the KPM Dashboard to allow administrators from national, state, district, and school-community levels to access data. Ensure Dashboard indicators and reports are made relevant for each person.	1	2019–2020	Funding for licensure	Information Management Division	
1.08.2	Develop a portal for parents to communicate with teachers and to receive information on a child's status, attendance, and learning outcomes.	1	2021	Funding, technical expertise	Information Management Division	
1.13.1	Identify good practices in the form of useful functions and feedback loops that support holistic education delivery and improve learning outcomes. Adopt and introduce these as reports and functions to the EMIS. Examples include informative ways of feeding back examination results to teachers to enable action to take place to ensure pedagogical improvement.	3	2023	Budget, human resources	Ministry of Education professional divisions	-

Evaluation Question number	Recommendation	Priority (1 = urgent, 2=medium priority, 3=low priority)	Timeframe (2019 to 2024)	Resourcing	Responsibility	Reference to ICT Transformation Plan 2019–2023
2.01.1	Develop a school report card which is accessible to the public. The school report card should provide stakeholders with critical information on the school which can help increase advocacy for change and community involvement in the local school. <sup>6</sup>	2	2021–2023	Budget	School Management Division, EPRD, Information Management Division	
2.07.2	Enhance staff capacity to use the EMIS by developing an EMIS in-service training module for teachers and administrators at school level to assist in improving their analysis and interpretation of the EMIS data to enhance pedagogical outcomes.	2	2019–2023	Funding	Respective divisions that own the systems and applications	

<sup>6</sup> An example of a comprehensive school report card can be found at: [www.illinoisreportcard.com](http://www.illinoisreportcard.com)



# 1 Introduction

## 1.1 Purpose and scope

Given the importance of quality disaggregated data on education for SDG reporting and national monitoring and systems improvement purposes, the United Nation Children’s Fund’s (UNICEF’s) East Asia and Pacific Regional Office (EAPRO), after consultation with the United Nations Educational, Scientific and Cultural Organization (UNESCO), has assisted Malaysia to undertake a review of its EMIS, to help identify ways in which the EMIS can be strengthened to promote equitable quality education and learning in the region. The review has examined and assessed the status of policy and data gaps and the extent to which the EMIS is being analysed and utilised. The review has had a particular focus on systems relating to individualised student data and tracking.

It is hoped that the findings generated in the review will lead to actioned recommendations for improving the EMIS and its use by the Government of Malaysia and its partners, and that the findings will also help to inform UNICEF EAPRO and other development partners on how they can better support the EMIS’s operation and utilisation in Malaysia. In the broader context, this review is being used to inform a three-country study which will make general recommendations regarding how countries can develop their EMIS. It is hoped that the findings generated in the broader study will lead to actionable recommendations for improving the EMIS and its use by governments globally, and that the findings will help partners to offer assistance in the area of EMIS development. This review has therefore involved government and partners during all phases and in the approval of the final report, to help ensure government and partners have full ownership of the findings and recommendations, which will lead to their eventual inclusion in national education policies and sector plans.

Two main review areas are investigated in this review, each having review questions which are responded to help inform conclusions and recommendations. The review questions, focusing on EMIS that track individual students at the school level, are separated into two areas:

- **Policy and data gaps** – This covers: plans to strengthen the EMIS; the coverage of national plans and SDGs in the EMIS; the coverage of equity and out-of-school children; quality, quality assurance, and data privacy; interaction with other data systems, management and position in the overall education data architecture; and resourcing and budgeting.
- **Data analysis and utilisation** – This covers: accessibility; processes of interpretation, analysis, and use; use for operations and monitoring, reporting, and planning; operation in relation to various systems; use for equitable resource distribution; and other requirements for improvements.

Responses in relation to both areas have helped inform the recommendations derived from this review. It is hoped that the findings and recommendations can help direct the Government of Malaysia towards improved and more effective implementation of its EMIS and provide guidance for other governments intending to develop their EMIS and to enable individual child tracking systems.

## 1.2 Methodology

The review was conducted over three working months and was conducted by the UNICEF country office and a national consultant, with the support of an international consultant. The primary methodology of data collection and analysis was qualitative. The qualitative review was informed by a comprehensive literature review (refer to Annex A) and by interviews with key stakeholders (refer to Annex B). The review was conducted in three phases, as shown in the diagram below. In practice, Phase 1 (desk review) and Phase 2 (key informant interviews) were conducted concurrently to ensure a continuous process of information triangulation and validation. Phase 3 involved a workshop with key stakeholders to discuss and validate the findings and finalise the recommendations.



Figure 2. Phases of the EMIS review

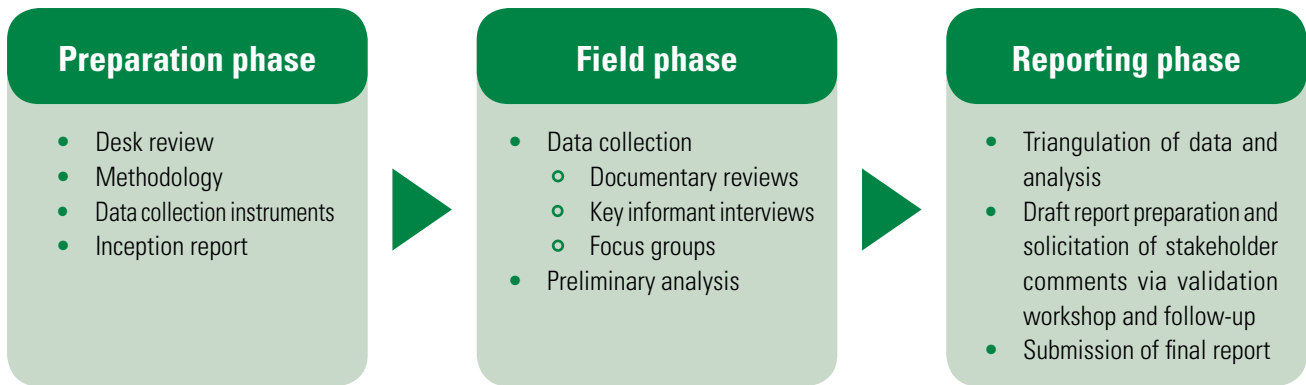
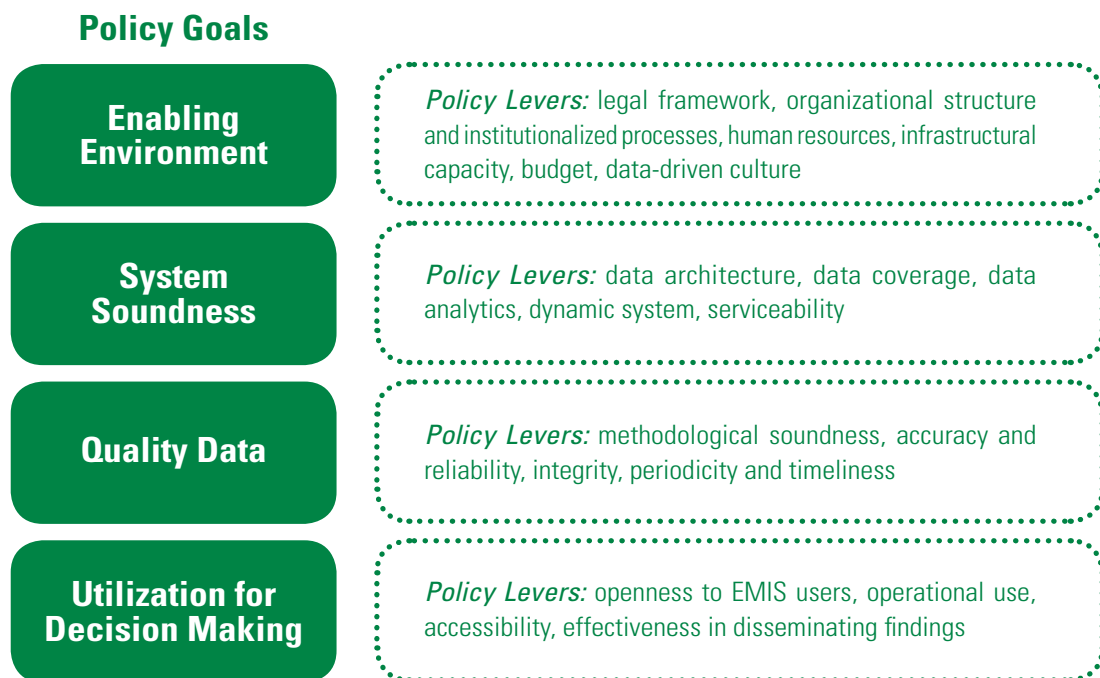


Figure 3. SABER EMIS thematic areas of analysis



Source: Saber EMIS Framework Paper, World Bank<sup>7</sup>

Key informant interviews were informed by the review questions, as well as by the World Bank Systems Approach for Better Education Results (SABER) EMIS methodology and tools commonly used in EMIS evaluation<sup>8</sup> and UNESCO's Data Quality Assessment Framework.<sup>9</sup> The research questions are presented in the research matrix in Annex D, the research rubric.

7 Abdul-Hamid, H. (2014) 'SABER EMIS Framework Paper', World Bank.

8 The SABER EMIS methodology utilises a structured evaluation process to provide education systems analyses, assessments, diagnosis, and opportunities for dialogue. At the global level, it improves the education systems knowledge base and uses this information to implement effective reforms. <http://saber.worldbank.org/index.cfm?indx=8&pd=2&sub=4>, accessed 27 March 2019.

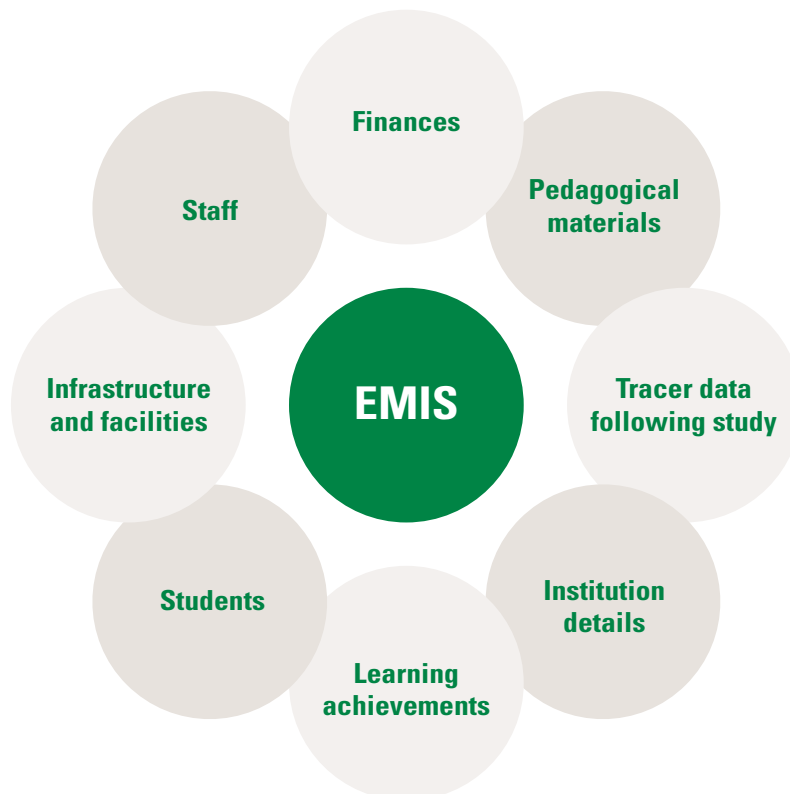
9 Developed to implement evaluation methodologies that assess the quality of data produced by national statistical systems, using such standards and tools for assessing education data quality produced by member states. [http://dqaf.uis.unesco.org/index.php?title=The\\_DQAF\\_Manual](http://dqaf.uis.unesco.org/index.php?title=The_DQAF_Manual), accessed 27 March 2019.

## 1.3 EMIS in the global context

EMIS can be defined as the ensemble of operational systems and processes, increasingly supported by digital technology, that enable the collection, aggregation, analysis, and use of data and information in education, including for management and administration, planning, policy formulation, and monitoring and evaluation. This definition insists on the systemic nature of EMIS — a fact which is often overlooked in efforts to reinforce government information systems.<sup>10</sup>

A comprehensive EMIS is defined as not only including **administrative and pupil data**, but also **financial, human resources, and learning data**, as well as data on graduates post study. This information should be available both at the individual and aggregate level, and should be used for policy analysis and formulation, planning, monitoring, and management at all levels of an education system.<sup>11</sup> A comprehensive EMIS is a system of people, technology, models, methods, processes, procedures, rules and regulations that function together to provide education leaders, decision makers, and managers at all levels with a comprehensive, integrated set of relevant, reliable, unambiguous, and timely data and information to support them in the completion of their responsibilities.<sup>12</sup>

**Figure 4. Elements of an EMIS, covering all sub-sectors of the education sector**



The type of data entered into the system needs to follow logic and a defined methodology, and have a well-defined purpose. A successful EMIS is credible, and operational in relation to planning and policy dialogue, as well as in relation to teaching and learning. It produces and monitors education statistics within an education system and has a multifaceted structure, comprising the technological and institutional arrangements for collecting, processing, and disseminating data.<sup>13</sup> It is crucial for tracking changes, ensuring data quality, and timely reporting of information, and facilitating the utilisation of information in decision-making.

<sup>10</sup> UNESCO (2018) 'Working Paper 5', *Working Papers on Education Policy Re-orienting Education Management Information Systems (EMIS) towards inclusive and equitable quality education and lifelong learning*.

<sup>11</sup> Abdul-Hamid, H. (2014) 'SABER EMIS Framework Paper', World Bank.

<sup>12</sup> UNESCO (2008) 'Education for All by 2015: will we make it? EFA global monitoring report', Paris.

<sup>13</sup> Abdul-Hamid H. (2014) 'SABER EMIS Framework Paper', World Bank.

A management information system (MIS) is designed to assist managerial and professional workers by processing and disseminating vast amounts of information for managers organisation-wide.<sup>14</sup> An MIS provides information for the management activities that are carried out within an organisation. The information is selected and presented in a form that is suitable for managerial decision-making and for the planning and monitoring of the organisation's activities. An MIS in the education sector (i.e. an EMIS) can be used to support education managers to make strategic, tactical, and operational decisions.

An EMIS can help provide accurate, comprehensive, and timely data collection, which can promote more rational and effective education policymaking. This can result in improved decision-making regarding: the volume and allocation of public financing, the best way to reach children most in need (due to socioeconomic circumstances, special needs, etc), staff recruitment, and training and quality and adherence to standards.<sup>15</sup>

## 1.4 The Sustainable Development Agenda and the vision of EMIS

The post-2015 Sustainable Development Agenda marks a substantial shift from the preceding Millennium Development Era. This is also true for the overall Education agenda. The main focus for the education sector under the Millennium Development Goals (MDGs) was on ensuring access, participation and completion of primary education as well as achieving gender parity in primary, secondary and tertiary education.<sup>16</sup> In contrast to this, the three main focus areas for the education sector under the Sustainable Development Goals (SDGs) are measurement of learning outcomes, improved measurement of equity in education<sup>17</sup> and a focus on lifelong and alternative means of learning.<sup>18</sup> The explicit focus on **equity in education** implies that in addition to reporting national averages, the selected education indicators should also be reported across different sections of the population, such as wealth, religion, gender, ethnicity, and disability status amongst others.<sup>19</sup> EMIS should be dynamic to enable the monitoring of groups often overlooked in administrative systems such as street children, refugees, stateless children and children of migrant workers.

The indicators measuring progress towards the education goals specified in the SDGs are reported at four different levels<sup>20</sup>: the global, thematic, regional and national. Given the priorities stated in the SDG, as well as the multiple levels of monitoring and evaluation, it is necessary to invest in better data and M&E systems. Currently there are two main issues with data globally. Firstly, there is not enough high-quality data available and secondly, much of the data that is produced is either not used or is not in a format/state that allows it to be used.<sup>21</sup>

Many countries are adopting the 'expanded vision of education' which incorporates the vision encapsulated in Sustainable Development Goal 4 (SDG 4) for 'Quality education and lifelong learning opportunities for all are central to ensuring a full and productive life to all individuals and to the realization of sustainable development'.<sup>22</sup> It is therefore important that EMIS manage information on all sub-sectors of education ranging from early childhood education, vocational education and non-formal education. Detailed information should be accessible to enable predictions concerning the potential workforce and to ensure that all people have access to education

14 Alavi, M., and Leidner, D., (1999) 'Knowledge management systems: Issues, challenges, and benefits', *Communications of the Association for Information Systems* 1(7).

15 Ishimine K., Tayler C., Bennett J. (2010) 'Quality and Early Childhood Education and Care: A Policy Initiative for the 21<sup>st</sup> Century', *International Journal of Child Care and Education Policy* 4(2), pp. 67–80.

16 UIS (2016), *Sustainable Development Data Digest, Laying the Foundation to Measure Sustainable Development Goal 4*, (UIS UNESCO, 2016)

17 Ibid..

18 Such as Non-Formal Education and Technical and Vocational Education and Training.

19 UIS, *Country readiness to monitor SDG 4 education targets Regional survey for the Arab States*, (UNESCO Institute for Statistics, 2016)

UIS, *Country readiness to monitor SDG 4 education targets Regional survey for the Asia and Pacific region*, (UNESCO Institute for Statistics, 2016)

20 Sustainable Development Solutions Network (SDSN), *Indicators and a Monitoring Framework for the Sustainable Development Goals Launching a data revolution for the SDGs*, (A report by the Leadership Council of the SDSN Revised working draft (Version 6), February 18, 2015)

21 UN, *Report on data gaps A world that counts: mobilising the data revolution for sustainable development*, (The United Nations Secretary-General's Independent Expert Advisory Group on a Data Revolution for Sustainable Development, 2014), <http://www.undatarevolution.org/wp-content/uploads/2014/11/A-World-That-Counts.pdf>.

22 <https://unstats.un.org/sdgs/report/2017/goal-04/> accessed 28<sup>th</sup> March 2018



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at any age. This places an increasing requirement on EMIS to be able to track an individual's progress through the whole education system and emphasizes the need for systems to be able to report on data longitudinally. The resulting design of EMIS is likely to be more complex and more integrated in terms of sub-sector data.

The drive to achieve global targets and participate in education in global initiatives such as the International Standard Classification of Education (ISCED) has helped enforce SDG 4 as an international standard. SDG 4 has influenced both the structure of plans, the use of key concepts and targets and goals by which a plan is measured. Global goals and targets help illustrate how far from a global target a country is, and national indicator standards, to provide a frame of reference for progress at the country level. This places increasing requirements on EMIS to be developed to respond to local planning, budgeting, monitoring, evaluation and administrative needs whilst at the same time conforming to international standards so as to enable comparison of data obtained through the EMIS with other regions and countries through globally recognized education indicators. EMIS should conform with international standards for data and education indicators such as internationally recognized definitions of indicators,<sup>23</sup> the education data standards of ISCED<sup>24</sup> and the requirement to monitor core SDG4 indicators.

Emerging evidence shows that large numbers of children are in school, but are not learning (ACER 2016), despite considerable investment on school infrastructure, training teachers, and learning materials. The new Sustainable Development Goal (SDG) 4, presents huge opportunities to meet this challenge through a strategic shift towards equitable quality education for all. This shift is essential. There has already been substantial work undertaken in determining how SDG 4 can be measured and which countries are prepared and able to effectively monitor against indicators required as part of SDG 4.<sup>25</sup>

23 OECD. (2015). Indicators database. Available at <http://www.oecd.org/education/database.htm>

24 The International Standard Classification of Education (ISCED) belongs to the United Nations International Family of Economic and Social Classifications, which are applied in statistics worldwide with the purpose of assembling, compiling and analysing cross-nationally comparable data. ISCED is the reference classification for organizing education programmes and related qualifications by education levels and fields. ISCED is a product of international agreement and adopted formally by the General Conference of UNESCO Member States

25 UNESCO UIS, *Country readiness to monitor SDG 4 education targets Regional survey for the Arab States*, (UNESCO Institute for Statistics, 2016)

UNESCO UIS, *Country readiness to monitor SDG 4 education targets Regional survey for the Asia and Pacific region*, (UNESCO Institute for Statistics, 2016)



There is also greater recognition that a complex interplay of socio-economic factors influences learning outcomes. These include but are not limited to: individual and family characteristics of students, such as gender, age, language spoken at home, preschool attendance, activities prior to attending school, student engagement in school activities and out-of-school tuition, parental literacy and local governance, school management, community engagement and social accountability. In addition, the type of school, the location of the school and the resourcing available to the school that the student attends also contribute to child learning outcomes.<sup>26</sup> Also important to the broader scope of child learning is information concerning child nutrition, clean water and sanitation.<sup>27</sup>

The SDG agenda has also focused on the need to view social development holistically. For example, many countries are now starting to monitor Early Childhood Development, which includes indicators derived from child protection, health, education, water, and sanitation and other sectors.<sup>28</sup> This emphasizes the need for a coordinated and rationalized approach to data and emphasizes inter-sectorial coordination and cooperation. Schools can play a focal role in supporting services for other ministries<sup>29</sup> and also report on key indicators relevant to other ministries.<sup>30</sup>

Therefore, in order to properly monitor child learning and address barriers preventing effective child learning, analysis of detailed information concerning the child and their family, the learning environment as well as the national and regional socio-economic factors is required. According to the Organisation for Economic Co-operation and Development (OECD), better data can help reduce inequity in education, including early childhood education, in multiple ways, including:<sup>31</sup>

- Identifying and providing systematic help to children at risk of not meeting academic and social goals;
- Directing resources to the schools, students and teachers with the greatest needs;
- Setting concrete targets for more equity in education, not only in access but also in quality and learning outcomes.

These requirements are placing increasing demands on systems to track individual children as they progress through the education system. Systems should enable disaggregation of data to allow for analysis of complex socio-economic factors affecting a child's progress through the education system or exclusion from it.

UIS recently reported the availability of global and thematic indicators across all countries reporting in the UIS database in 2017.<sup>32</sup> They noted that 10 of the 43 indicators were unavailable in all countries, while 8 global indicators and 11 thematic indicators are reported in 50% or fewer countries. Only one global indicator and six other thematic indicators have more than 75% coverage. UIS concluded that countries are struggling to report and, in many cases, even to collect the data needed for calculating key indicators for the follow up and review of SDG 4.

26 ASER, *Improving Quality Education and Children's Learning Outcomes and Effective Practices in the Eastern and Southern Africa Region Report*, (UNICEF ESARO, Australian Council for Education Research (ASER), 2016)

Grantham-McGregor S.M, Powell C.A, Walker S.P, Himes J.H (1991) Nutritional supplementation, psychosocial stimulation, and mental development of stunted children: the Jamaican Study, *Lancet*. 1991 Jul 6;338(8758):1-5.

27 Ibid...

28 Examples include Chile, Belize and Uganda. UNICEF (2017a, 2017b) has developed a framework of ECD indicators derived from SDG indicators and other research to help guide and focus countries on the monitoring of ECD.

29 Examples include reporting deworming and vaccination programmes to the Ministry of Health and reporting incidences of violence against children to authorities monitoring child protection.

30 For example, reporting the quality and source of water supplies in schools to the Ministry of Water and Sanitation.

31 OECD, *Equity and Quality in Education: Supporting Disadvantaged Students and Schools*, (OECD Publishing, 2012). <http://dx.doi.org/10.1787/9789264130852-en>. Referenced on 31st March 2019

32 UNESCO. *SDG 4 Data Digest 2017. The Quality Factor: Strengthening National Data to Monitor* (UNESCO 2017)

## 1.5 Overview of the education system in Malaysia

### 1.5.1 Background

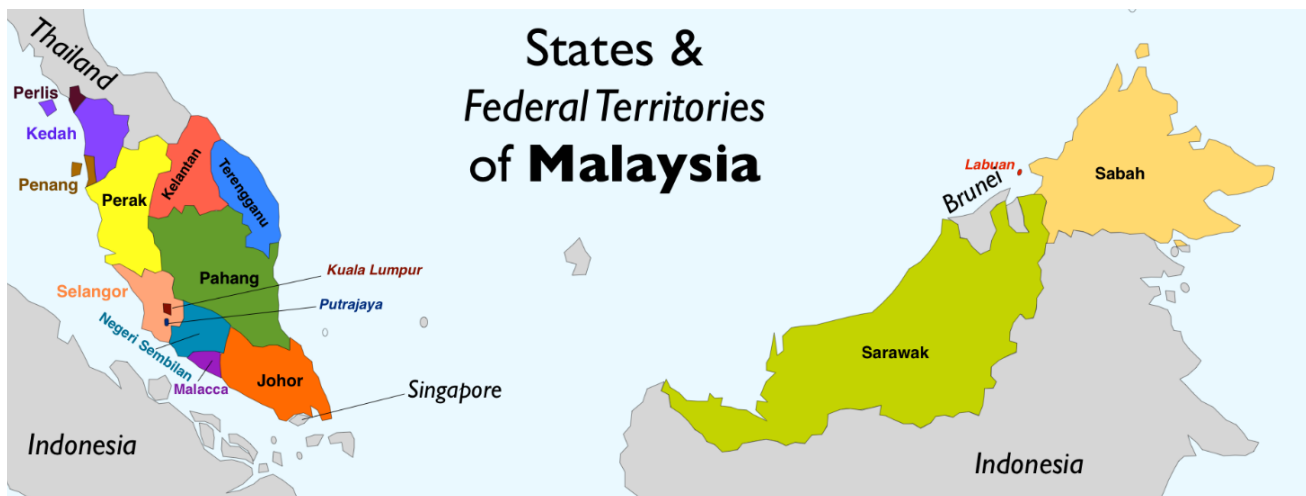
Malaya gained its independence from the British in 1957. Malaya, together with Sabah, Sarawak, and Singapore, then formed the Federation of Malaysia in 1963. Subsequently, Singapore was separated from Malaysia in 1965. Today, Malaysia comprises 14 states, namely Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Penang, Perak, Perlis, Sabah, Sarawak, Selangor, Terengganu, and the Federal Territories of Kuala Lumpur, Labuan, and Putrajaya (see Figure 4).

Malaysia has a population of 32.6 million (2018 figures), of which approximately 29 million are citizens.<sup>33</sup> In terms of the population by age group, more than 23.8% of the population are between 0 and 14 years, almost 70% are between the ages of 15 and 64 (the working group), and 6.5% are 65 years and older.<sup>34</sup>

Malaysia is a multi-ethnic country that consists of different ethnic groups. The Bumiputera (translated Princes of the Soil), which includes ethnic Malays and other indigenous groups, make up of 69% of the population. Malaysian citizens of Chinese and Indian descent are the second and third largest ethnic groups, at 23% and 7%, respectively.<sup>35</sup>

As at 2015, only 0.4% of 32 million Malaysians were living below the national poverty line. The same year also saw Malaysia recording its lowest Gini coefficient index,<sup>36</sup> of 41.

**Figure 5. Map of states and Federal Territories of Malaysia**



### 1.5.2 Education system in Malaysia

The table below outlines the national education system in Malaysia, which is divided into pre-school, primary, secondary (lower and upper), pre-university, and higher education.

33 Department of Statistics Malaysia (2019) 'Demographic Statistics Fourth Quarter (Q4) 2018'.

34 Department of Statistics Malaysia (2018a) 'Current Population Estimates, 2017–2018'.

35 Ibid.

36 This illustrates the income disparity, whereby 100 is the most unequal situation and zero is a perfectly equal situation.

**Table 2. Structure of Malaysian education system**

Education level	Duration / grade	Age group	Enrolment
Pre-school education	2 years	4–5 years	Non-compulsory
Primary education	Years 1–6	6–11 years	Compulsory
Lower secondary education	Forms 1–3	12–14 years	Non-compulsory
Upper secondary education (academic, technical/vocation, and religious streams)	Forms 4–5	15–16 years	Non-compulsory
Pre-university	Form 6, Matriculation	17 years	Non-compulsory
Higher education (universities, university colleges, polytechnics, community colleges, colleges)		18+ years	Non-compulsory

The current Ministry of Education, which was established in June 2018 with the merger of the Ministry of Higher Education into one ministry, oversees all levels of education, ranging from pre-primary, primary, and secondary, to vocational and technical, as well as higher education. More than 5.6 million students are enrolled across the 16,500 educational institutions from pre-primary to higher education that are under the jurisdiction of the Ministry of Education. Table 3 shows the exact student enrolment, as well as the number of teachers and instructors in these institutions.

While the primary, secondary, and technical and vocational levels are made up mostly by schools and institutes under the Ministry of Education, the pre-primary and higher education levels have a significant private sector involvement. At the pre-primary level, student enrolment across the 6,111 pre-schools only makes up almost half of the total population of pre-school children. The remaining pre-school children are enrolled across 18,991 pre-schools that are operated privately or by other government agencies. Similarly, student enrolment across public higher education institutions – 20 universities, 33 polytechnics, and 94 community colleges – makes up of 53% of the total population in higher education. The remaining 47% of students are enrolled in private higher education institutions that includes universities, university colleges, colleges, and international branch campuses.

Although the large majority of primary and secondary students are enrolled in schools under the Ministry of Education, there is a wide variety of schools both within and outside of the direct jurisdiction of the ministry. Apart from the national primary and secondary schools that use the Malay language as the medium of instruction, there are vernacular schools at the primary level that use Mandarin and Tamil as their medium of instruction. These vernacular schools are known as national-type schools and are managed and supported by the Ministry of Education. At the secondary level, there are special education, special model, sports, arts, and government-aided religious school, which also receive support and are managed by the Ministry of Education. In addition, there are also religious primary schools under the state religious departments, as well as international and private schools, which do not receive financial support from the Ministry of Education. Specifically at the secondary level, there are also 60 Chinese independent schools that are supported by the Chinese community through donations, as well as institutions managed by other government agencies, such as Majlis Amanah Rakyat.

**Table 3. Student enrolment, teachers, and institutions of the Ministry of Education Malaysia, 2018**

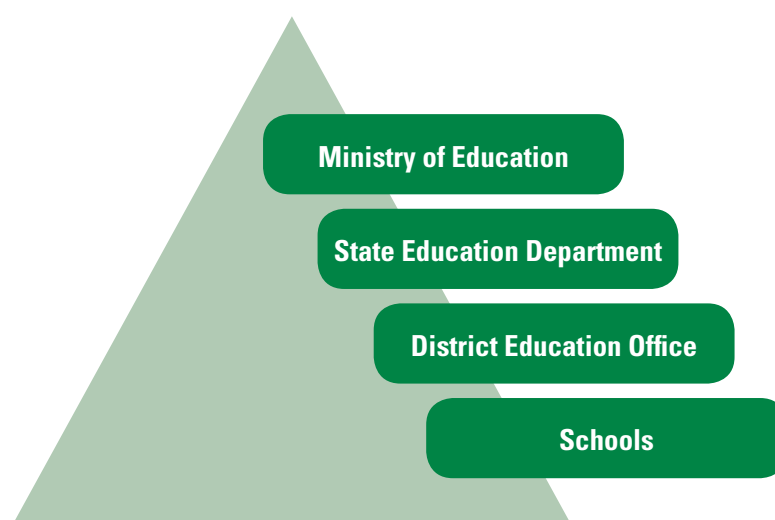
Education level	Student enrolment	Number of teachers	Number of institutions
Pre-school education	203,690	9,191	6,111
Primary education	2,693,318	240,101	7,776
Secondary education (includes Form 6)	2,041,798	183,465	2,426
Matriculation* (2017 data)	22,771	2,464	15
Teacher training college	13,334	3,180	27
Community college	20,921	2,724	94
Polytechnics	99,606	7,376	36
University*	538,555	31,740	20

Source: Ministry of Education, 2018; Ministry of Higher Education 2018<sup>37</sup>

### 1.5.3 Organisational and institutional structure

The education system, as a whole, is under the jurisdiction of the Ministry of Education. The ministry is responsible for managing the school system – more specifically the primary and secondary school system – through overseeing and regulating the curriculum, controlling national examinations, as well as supervising the development of education in Malaysia.<sup>38</sup>

While the Minister of Education heads the ministry, the Ministry of Education is led administratively by the Secretary General of Education and professionally by the Director General of Education. As the Ministry of Education is part of the federal government, the operationalisation of primary and secondary schools is devolved to the education departments across the 16 states (see Figure 5). The State Education Department is led by the Director.

**Figure 6. Administrative the levels of education system in Malaysia**

<sup>37</sup> Ministry of Education (2018) 'Quick Facts 2018: Malaysia Educational Statistics', Ministry of Education, Putrajaya. Ministry of Higher Education (2018) 'Higher Education Statistics 2017', Ministry of Higher Education Malaysia, Putrajaya.

<sup>38</sup> Samuel, Tee, and Symaco (2017) *Education in Malaysia*.

In each school, the principal/headmaster is the main person responsible for all of the affairs of the school and he/she reports to the District Education Office. The principal/headmaster is assisted by senior assistants, who are responsible for academic affairs, student affairs and extra curriculum activities.

For pre-schools, the Ministry of Education is jointly involved with the Prime Minister's Office, the Ministry of Women, Family and Community Development, and the Ministry of Rural Development in providing pre-schools in Malaysia. Government agencies, such as the Community Development Department and the Department of National Unity and Integration (JPNIN), are some of the operators of pre-schools. The Ministry of Education manages the National Information System for Pre-Schools.

As stated earlier, in the current government establishment the Ministry of Higher Education has been subsumed under the Ministry of Education. While public universities are federal statutory bodies and are coordinated and governed by the Department of Higher Education, polytechnics, community colleges and matriculation colleges are given more room to operate independently as compared to schools, and these institutions are governed by the respective departments in the Ministry of Education. The organisational chart for the Ministry of Education is shown in Annex F.

## 1.6 Overview of legislative and policy framework for education

The major piece of legislation for education in Malaysia is the Education Act 1996 (Act 550), which defines the national education system and governs wide-ranging matters on education from pre-school to primary, secondary, post-secondary, and higher education, as well as religious teaching, teacher education, special education, technical education, and polytechnics. This legislation also details the role of the national curriculum and the prescribed examinations. Apart from the roles and responsibilities of the Minister of Education, Act 550 also sets out the duties of the Director General of Education, State Directors of Education and Education Officers, the Registrar General of Educational Institutions and Teachers, the Chief Inspector of Schools, and Inspectors of Schools, as well as the Director of Examinations. In addition to Act 550, the Universities and University Colleges Act 1971 and Private Higher Education Institutions Act 1996 are the two major pieces of legislation that have been enacted to govern the public universities and private higher education institutions, respectively.

In terms of policies, the National Education Policy articulates the policies and guidelines for the national philosophy of education; the vision, mission, and objectives for education; as well as national curriculum, national language, and various aspects of education.<sup>39</sup> The National Education Policy also operationalises education by providing guidelines for mapping out the different levels of education and types of institutions within the national education system of Malaysia.

While the National Education Policy defines the current state of education, the Malaysia Education Blueprint 2013–2025 (Pre-school to Post-Secondary Education) and Malaysia Education Blueprint (Higher Education) 2015–2025 collectively provide a seamless overview of the future direction for education in Malaysia up to 2025. The attributes and aspirations of the education system of Malaysia as regards students are encapsulated within the Blueprints, and, importantly, the Blueprints complement the National Education Policy in driving the Malaysian education system forward.

39 Ministry of Education (2017) *Dasar Pendidikan Kebangsaan* [National Education Policy].





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## 1.7 EMIS in Malaysia

### 1.7.1 History of the EMIS

The EMIS, as an electronic system, was first introduced by the Ministry of Education Malaysia in 1997, with the financial support of the World Bank.<sup>40</sup> EMIS is comprised of many systems. To avoid confusion, from this point on the abbreviation 'EMIS' will refer to the education management information ecosystem in Malaysia, which is made up of many systems and applications. The EMIS replaced the less effective, labour-intensive and time-consuming manual data collection processes in schools.<sup>41</sup> The EMIS was pioneered under the EPRD in the Ministry of Education, with the objective of providing data for planning purposes.<sup>42</sup> The EMIS was initially built as an offline system using the MS Access system and was developed for primary and secondary schools. The EMIS was comprised of three modules for schools, teachers, and students in aggregated form. Data were updated three times a year.

Between 2000 and 2002, with the support of another consulting company, Accenture, there was an attempt to enhance the EMIS into an online system, as well as to introduce an executive information system that included analysis and reporting.<sup>43</sup> The online system was built on a C# and MS Exchange Server. However, the enhancement did not materialise due to several constraints to the online system in terms of the system's capability and connectivity across schools in the country, as well as the readiness to adopt the information system for analysis that directly supported and facilitated decision-making. In 2003, the EMIS reverted back to the offline, MS Access system.

40 With technical support from an American consulting company, Harvard Institute for International Development

41 Mohamed Ali, A. R. (2001) 'Ke Arah Peningkatan Kualiti Data dan Penggunaannya di Sekolah [Towards Quality Improvement of Data and its Usage in School]'

42 Markhaini Wati, S. (2008) 'Using School Information for Resource Management in the U.S. Department of Education: What the Ministry of Education Malaysia can learn?'

43 Azwan, A. A. (2008) 'Executive Information System (EIS) Kementerian Pelajaran Malaysia: Bolehkah menjadi kenyataan? [Executive Information System in Ministry of Education Malaysia: Can it become a reality?]'.

After a decade, the EMIS was developed into an online system in 2009. The development was carried out by an external vendor and the system was built using the MySQL database management system. The EMIS maintained the same three main modules on schools, teachers, and students. The data for schools and teachers were based upon individual schools and individual teachers, while the data for students was aggregated to cohorts, subjects, and other indicators in data collection forms.

## 1.7.2 The current EMIS ecosystem

2015 was a watershed moment for the EMIS in Malaysia. An administrative decision was taken at the Ministry of Education to collect data on enrolment, teachers, and schools via three separate systems, namely the School Management Module, the Teacher Management Module, and the Student Management Module. The School Management Module remained with EPRD and is informally known as the EMIS, while the other two modules were managed by the School Management Division.

However, there still exist multiple other applications that serve a range of purposes which are specific to different divisions and municipalities. These have been developed over the years with little coordination or coherence. As a result, there is no single integrated EMIS in Malaysia.

The EMIS ecosystem in Malaysia, especially after 2015, has continued to develop without adequate coordination. As noted, divisions and agencies in the Ministry of Education have developed their own systems and applications for specific purposes to capture data related to their needs, and these systems and applications have been developed at different times using different platforms and software. In addition, other related governmental agencies outside of the Ministry of Education, such as the Public Service Department, Public Works Department, and the Ministry of Finance, have also extended their programmes and applications for the use of schools and these have also become a part of the EMIS ecosystem. In addition to national and ministry-level systems and applications, there are also instances of cases where applications have been developed by teachers or where schools have been adopted and included in the national EMIS ecosystem.

The proliferation of systems and applications began even prior to the separation of the EMIS into three different modules in 2015. In 2007, there were 29 actively used systems and applications developed across 15 divisions in the Ministry of Education.<sup>44</sup> While some of these systems were developed to stand alone, most of the systems and applications then were dependent on the consolidated EMIS database, which at that point in time was still offline.

By 2016, at least 87 official systems and applications were identified in the EMIS ecosystem within the Ministry of Education, through a stock-taking exercise undertaken by the Ministry. There were also 122 other systems and applications that were operating across schools nationwide. The 87 official systems and applications (see Annex C) are divided into three main categories: operations, back office, and services. The systems and applications listed under operations



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<sup>44</sup> Markhaini Wati, S. (2008) 'Using School Information for Resource Management in the U.S. Department of Education: What the Ministry of Education Malaysia can learn?'

are those that relate to the operations in schools and that are owned by the Ministry of Education. The back office systems and applications involve systems and applications for the operations within the Ministry of Education, as well as those related to other governmental agencies. Services systems and applications are the systems and applications for engagement with parents and the public.

By 2018, there were 239 systems and applications within the EMIS ecosystem identified at the Ministry of Education. This does not include systems and applications developed and used at the sub-levels of state, district, and schools. The merger of the Ministry of Higher Education in June 2018 further brought 110 systems and applications relating to post-secondary education into the framework of the Ministry of Education.

### 1.7.3 Legal and policy framework for EMIS

The legal basis for the EMIS to operate within the policy framework is derived from the Cabinet Committee Report 1979, in which EPRD was identified to be the 'one-stop' information centre for education.<sup>45</sup> The responsibility given to EPRD was then used as the basis for the EMIS to be established and for allowing EPRD to coordinate all efforts in the collection of educational data in an integrated manner. Through Professional Circulars issued by the Director General of Education to the Education Departments at the state, division, and district levels, and to schools and teachers, these instructions became the basis of authority for the EMIS to operate within schools. For instance, Professional Circular 14/2007 instructed all primary and secondary schools to appoint a specific teacher to be in charge of data, known as the *Guru Data* (Data Teacher). Another example is the use of electronic attendance taking through the attendance system in the Student Information System (APDM), to replace manual attendance taking for students; this was stipulated by Professional Circular 1/2019.

While the EMIS does not derive its legal basis from Act 550, one specific component related to examinations data is provided in the Act. This is the Director of Examinations, which is an official position that is prescribed in the Act. The Director of Examinations is independent of the Director General of Education and is responsible for the Examination Syndicate. The responsibilities of the Director of Examinations are outlined in Act 550.

The Chief Inspector of Schools is another official position prescribed in Act 550. The role of the Chief Inspector of Schools is to ensure adequate teaching standards are maintained in schools. Under the office of the Chief Inspector of Schools, there is also the Malaysian Education Standards and Quality (SKPM) system, which is a tool that is used to evaluate schools. This system is part of the larger EMIS ecosystem.

Apart from the legal and administrative structure within the Ministry of Education that shapes the EMIS, the Malaysian Government Development Initiative has also had a significant influence on the development framework of the EMIS. In 2009, the National Key Results Areas (NKRA) initiative was launched by the Prime Minister; education is one of the six areas. Under NKRA, one of the initiatives related to the EMIS is the initiative to upgrade SKPM to SKPM version 2.0 (SKPMg2). Other initiatives under NKRA are the SAPS, which enables parents to check and keep track of the academic records of their child in school examinations online, as well as the individual student database, APDM.

The legal framework does not specify the allocation of a budget for EMIS.

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45 Ibid.



### 1.7.4 Major systems and applications in the EMIS ecosystem

This section focuses on the Education Data Repository and seven major systems and applications within the EMIS ecosystem. The description of the Repository and these systems and applications given here provides the context for the discussion presented in the other sections of this report.

**A. The Education Data Repository** – Following the dividing of the EMIS to various divisions in the Ministry of Education, and the proliferation of systems and applications within the EMIS ecosystem, one initiative was to set up a repository for various systems and applications, to share their data. The repository Education Data Repository initiative began in 2017 and, to date, 12 systems and applications have been integrated into the Repository. The systems and applications were developed individually and owned by different divisions, and there had been a lack of concerted effort to bring all of these data together. Hence, many were operating in silo and this reduced the ability to subject the data to any other form of analysis than descriptive analysis.

The Repository covers five main areas of educational data: students, school, teachers, finance, and assessment. Among the major systems and applications that have deposited their data in the Repository are: APDM; the Student Character System (SSDM); the Physical Activity, Sports and Co-curriculum Assessment (PAJSK); SPS (the EMIS for schools); e-Operasi; e-Bantuan; and SAPS. 155 tables are gathered as raw inputs before being extracted and cleaned with 155 and 88 scripts respectively. Data on students are extracted daily, while the other four areas of data are extracted weekly. The final product of the Education Data Repository is made up of 88 tables, which can be used to carry out data analysis and data mining. The analysed output can be viewed on a dashboard, which at this point is accessible only to the top administrators of the Ministry of Education. Data exploration in the repository can be undertaken at four levels:



- descriptive analytics (what happened?);
- diagnostic analytics (why did it happen?);
- predictive analytics (what will happen?); and
- prescriptive analytics (how can we make it happen?)

The combination of these four levels of analytics makes it possible to bring hindsight and insight to a particular situation, based on the empirical data, and, more importantly, also makes it possible to apply foresight. Thus, one of the strategic plans to strengthen the Repository involves developing the analytical capability of teachers and officers working with data at the Ministry of Education, as well as at state and district levels.

The Repository is connected to other major databases of other governmental agencies, including the National Registration Department and the Government Data Exchange initiative. Hence, proposals to strengthen the Repository include strengthening the cooperation with other governmental agencies, introducing more indicators (particularly those related to the SDGs), as well as enhancing the governance of data by reducing overlapping responsibilities across divisions on similar indicators and targets in the data.

- B. SPS<sup>46</sup>** : This system contains information about schools, especially infrastructure, facilities, equipment, and assets, under the purview of EPRD. Detailed information is captured, including the size of schools, their geographical location using the Global Positioning System (GPS), records of their equipment and assets, schools' financial accounts, as well as their usage of utilities like electricity and water. There are other modules that are housed in SPS, including the modules for sports management and Science, Technology, Engineering and Mathematics (STEM) monitoring for the provision of science laboratories in schools. Data in SPS are also used to determine the Elaun Khas Mengikut Lokasi Tahap Kesusahan (special allowance for remote areas). Beginning in 2019, SPS is considered as the major source of data for procurement and tender processes in the Ministry of Education for schools across the country. In schools, the Data Teacher is officially responsible for the SPS, as prescribed in Professional Circular 7/2018.
- C. E-Operasi:** This system contains a comprehensive database of all teachers in schools. e-Operasi is the main database on teachers and is used in the planning of positions, the placement and transfer of teachers, and the monitoring of teachers (including attendance and movement on a daily basis), across the various administrative levels from the school to the district, division, state and national levels at the Ministry of Education. Importantly, e-Operasi also enables administrators in schools and at various administrative levels to monitor the capacity and shortage of teachers in each and every school, as well as in relation to specific subjects. The system represents the continuation of the Teacher Management Module of the EMIS, which existed up to 2015. The compilation of data on teachers under the School Management Division began in 2008 with a MS Excel and MS Access platform through manual forms, before switching to the online based e-Operasi following the disintegration of EMIS. The information in this database is currently verified by individual teachers four times a year and is administered by the Senior Assistant for Administration in schools, assisted by an administrative assistant. This system is linked to the Human Resource Management Information System of the Public Service Department, as well as other applications within the Ministry of Education, such as those relating to performance evaluation (e-Performance, under the Competence Division) and promotion (e-Promotion, under the Human Resource Division).
- D. APDM** – This system contains a comprehensive database of individual students in schools. Although the system is related to the Student Management Module of the EMIS, which existed up to 2015, APDM is significantly different – whereas the EMIS module tracked students in an aggregated form, APDM is a database containing individual student information. Before this system was put online, the student information system was stored offline using MS Access and had to be manually combined across the schools in a district, and subsequently all the way to the national level. In 2012, an initiative was undertaken to develop the online system through a private vendor, under the NKRA initiative. However the initiative failed and the system was brought back to the School Management Division in 2013 and implemented

46 Also known as EMIS for Schools.



by putting together the data from the MS Access offline databases. A pilot of APDM involving six states was operated in 2013 and was fully rolled out across the country in 2014. The migration from the offline MS Access to the current Oracle program has been challenging and has compromised the reliability and accuracy of the data. Despite many efforts to clean the data, there are still inconsistent and inaccurate data in the database.

In 2014, while the data of existing students were migrated to the system, data for new students coming into Standard 1 and Form 1 were extracted from the National Registration Department database, whereby schools were only required to key in the national Identity Card (IC) number for the students as unique identifiers. This extraction function was further enhanced in 2018 by linking up with the National Registration Department's MyIdentity system. Students that do not have an IC as a unique identifier, such as non-citizens or those without the necessary documents, have to get the relevant paperwork from the Immigration Department or National Registration Department, and pay a levy at the District Education Office, before the class teacher can manually register them in APDM. Despite shortcomings in terms of the reliability and accuracy of its data, APDM serves as the main database for many other systems and applications that require individual student data. These include electronic attendance, SAPS, PAJSK, SSDM, and, importantly, the Online Examination Registration System for major public examinations with the Examination Syndicate.

**E. SAPS** – This system is an electronic report book that keeps track of individual students' academic records.

This system is held under the School Management Division. Teachers who are responsible for instructing a particular student in each subject will enter the student's marks for a test, the mid-year examination, and the year-end examination. The trial examination is also recorded in this system for all students in Year 6 and Form 5 sitting the public examination. Parents can access their child's record by entering the IC number or the unique identifier registered with APDM. The system extracts the basic student information from APDM. Apart from providing a record, SAPS can also be regarded as a teaching tool: based on every student's result from the previous examination in the subject, teachers can project the Expected Test Result prior to administering the examination. SAPS was created by a teacher, and was subsequently adopted by their school and then their district, and eventually became a national system under the NKRA initiative. The prior result became the basis for teachers to evaluate the past performance of students and the Expected Test Result became the target for students to achieve after completing lessons. According to teachers, despite this process being tedious and time-consuming, this feature in SAPS has been arguably one of the most useful features across the many systems and applications that directly impact on teaching and learning within the classroom.

**F. SSDM** – SSDM functions as a character assessment system for students. There are three main functions

of this system: to record wrongdoing and disciplinary problems, to record good deeds and commendable character, and to refer students for counselling in cases that are not disciplinary-related. Prior to 2016, SSDM only focused on the wrongdoing and disciplinary problems of students, similar to the 'criminal records database'.<sup>47</sup> The function relating to referring students for counselling is an important mechanism to detect potential problems with students leading to dropout and other more serious issues. For instance, students that may have shown a tendency towards committing suicide, that have family problems, that engage in drug use, or that experience other more serious but not disciplinary-related issues, can be referred for counselling electronically. Teachers can also report disciplinary problems or reward commendable character in the system, which functions like a merit and demerit system to assess the overall character of each student. Access is granted to Senior Assistants of Student Affairs and the headmaster/principal, as well as to counselling teachers<sup>48</sup> and teachers involved in disciplining students. Unlike other systems, data from this system reside at the school level. If the student transfers schools the disciplinary record starts afresh in the new school.

**G. SKPMg2:** This system is the school management system put in place by the Inspectorate of Schools Division to facilitate school management. This management system comprises five standards: (i) leadership; (ii) organisational management; (iii) curriculum, co-curriculum, and student affairs management; (iv) learning

<sup>47</sup> SSDM existed before 2007 but was a standalone system under the administration of the School Management Division.

<sup>48</sup> Teachers who provide counselling

and facilitation; and (v) student development. For standards i to iii, there are multiple items that require teachers to evaluate the management of their schools and to provide evidence for their score. Each teacher is given a one-page form to manually fill in, and a taskforce of teachers in the school is responsible for transferring the information in the manual form into the electronic system. For standard iv on learning and facilitation, the first assessment of the year is intended to be a self-assessment for every teacher, and the second assessment is for an administrator or senior teacher to evaluate the teacher's teaching and facilitation. Standard v, however, is extracted directly from the three systems to indicate the overall performance of students in the school, which includes their results in major public examinations, co-curriculum participation and achievement, and the character assessment contained in SSDM. The first version of this system was set up in 2010 and this was enhanced further in 2017 to the current system. In previous years, this exercise was done three times a year, but beginning in 2019 it only takes place twice a year. The objective of SKPMg2 is to act a self-audit within schools, although prior to 2016 the assessment of SKPM was used to rate schools to determine high performance schools and to categorise schools according to bands.

**H. Online Examination Registration System (SPPAT)** – This is a standalone administrative system for Malaysian Certificate of Education (SPM) candidates, which is administered directly by the Examination Syndicate and which stores information on students and their SPM examination outcomes. SPM is the public examination for students that takes place at the end of Form 5. Other examination registration systems are administered jointly by the Examination Syndicate with the Information Management Division. SPPAT extracts the student information from APDM but has to re-process the data to suit the use for examination registration. Two notable aspects that are involved in the re-processing of data from APDM is, first, the need to provide a 12-digit unique identifier for students that do not have an IC number (which is also 12-digit) as the 12-digit unique identifier is an important indicator throughout the examination process. Second, SPPAT has to re-classify the candidates into one of four ethnic/national groups, whereas data in APDM are much more elaborate. SPPAT is built upon the SQL system. It has a function whereby after examiners key in the marks of the scripts, the system auto-generates the relevant analysis and prints out the results and a certificate. Interestingly, SPPAT also enables the patching of multiple SPM results, whereby a student can sit for the SPM in different years and the best result for the subjects can be patched into one SPM certificate. This feature enables students to improve their performance, and also encourages those who have not performed well in the examination to continue to improve.

## 1.7.5 EMIS data coverage

Educational data are collected across all levels, except the non-formal education sector.

For pre-primary school, the coverage is 100% for pre-schools established by the Ministry of Education. These pre-schools are located within primary schools and the data collection instrument for teachers and school is in the same system as that of the primary schools within which they are located. However, the data collection instrument for enrolment is different. There are pre-schools which are public, set up by other governmental agencies, as well as those which are privately owned. These pre-schools have the option to voluntarily participate in the data collection exercise.

The coverage for primary and secondary public schools in terms of SPS is 100%. However, for other systems, such as e-Operasi for teachers and APDM for students, the coverage is not 100%. For instance, e-Operasi does not include teachers not based in schools, such as the officers who are based in the district or state education department or even the Ministry of Education. Coverage for APDM also does not include schools under the jurisdiction of other governmental agencies. For private schools, the Private Education Information System (SMIPS) is used to collect aggregated data on students.

The MyMOHES system, which stores information on higher education, only includes all public universities. However, there are other sources of educational data, such as the Tracer Study data or the Research Assessment Data that the Ministry of Education and Department of Higher Education collect, and these systems include private universities and other higher education institutions, both public and private. Technical and vocational training institutions under the Ministry of Education have coverage of 100%.



## 2

# Policy and data gaps

## 2.1 (1.01) Does the country have a strategic plan to strengthen the EMIS?

### 2.1.1 Main findings

Beginning in 2019, the Ministry of Education has launched a five-year ICT Transformation Plan 2019–2023. The ICT Transformational plan is comprised of seven components:

- ICT Strategy and Architecture;
- ICT Decision-Making;
- ICT Governance;
- ICT Organisational Structure;
- ICT People;
- ICT Support Management; and
- ICT Delivery Management.

A total of 27 initiatives are listed in the ICT Transformation Plan: 11 of the initiatives are intended to address and make improvements in relation to fundamental issues related to operations, and the remaining 16 initiatives are innovative approaches to be undertaken by the Ministry of Education to ensure the transformational and continuous development of ICT. The ICT Transformation Plan recommends the consolidation of ICT-related functions be placed under the Information Management Division, as the sole coordinating division related to ICT.

Annex E contains a list of application-related initiatives that are supported under the ICT Transformation Plan and related to the EMIS. The initiatives include: (A) the improvement of existing systems, and (B) the development of new functionality or systems. The initiatives emphasise the standardisation, rationalisation, and integration of the existing systems, and a reduction in the amount of systems. The aim is greater interoperability between systems and shared data. Emphasis is also placed on ensuring the systems are made more applicable to the needs of users at the school and ministry levels, as well as improving the systems and access to the systems for use and reporting at all levels.

These initiatives are scheduled to be carried out across the five years between 2019 and 2023, as shown in Figure 7. It is important to note that many of specific initiatives will directly impact and enhance the EMIS ecosystem; they are discussed in detail in the relevant sections below.

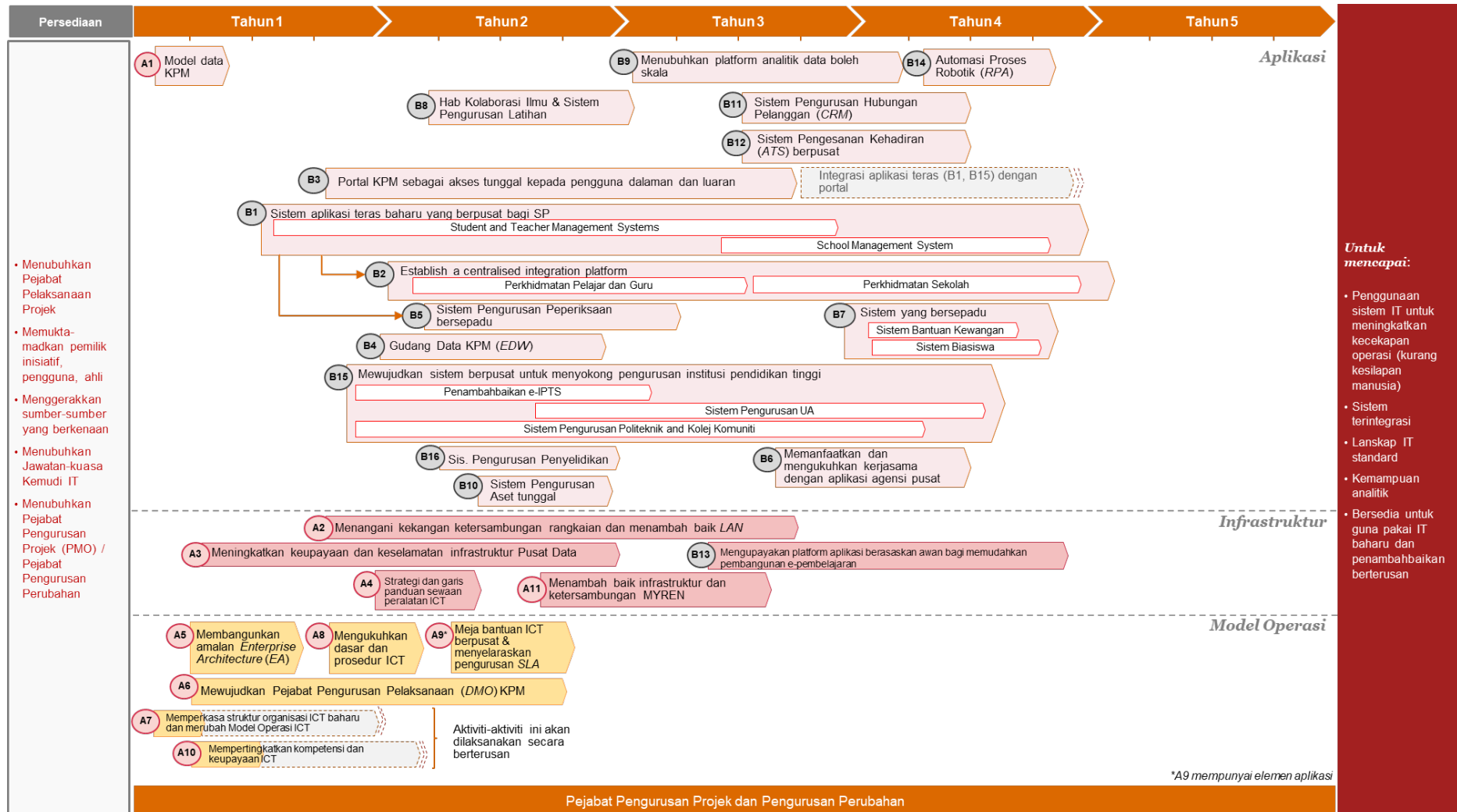
One essential feature of the ICT Transformation Plan is that it provides the architecture blueprint for the proposed integrated EMIS ecosystem that connects various education operational and support applications across the data centres, and for integrating these applications into the Ministry of Education portal and external applications. Having an architecture blueprint will also ensure that the future direction of ICT and the EMIS ecosystem in the Ministry is driven by its own framework and requirements, not by external partners, vendors, and initiatives of various interested parties. This approach is supported by one initiative focusing on the development of a standardised platform for new systems and applications.

Current funding for the ICT Transformation Plan is based on pooling together the operational expenditure of several divisions for implementing the initiatives. Without capital/development expenditure, the major aspects of the Plan concerning infrastructure and security will be difficult to achieve.

## 2.1.2 Recommendations (1.01)

**Recommendation 1.01.1:** The Ministry of Education should continually allocate sufficient funds for the ICT Transformation Plan to ensure smooth implementation that can enhance the overall EMIS ecosystem, especially for ongoing maintenance and further development of the systems.

**Figure 7.** Timeline of ICT Transformation implementation



- Menubuhkan Pejabat Pelaksanaan Projek
- Memuktamadkan pemilik inisiatif, pengguna, ahli
- Menggerakkan sumber-sumber yang berkenaan
- Menubuhkan Jawatan-kuasa Kemudi IT
- Menubuhkan Pejabat Pengurusan Projek (PMO) / Pejabat Pengurusan Perubahan

- Untuk mencapai:**
- Penggunaan sistem IT untuk meningkatkan kecekapan operasi (kurang kesilapan manusia)
  - Sistem terintegrasi
  - Lanskap IT standard
  - Kemampuan analitik
  - Bersedia untuk guna pakai IT baharu dan penambahbaikan berterusan



## 2.2 (1.02) Does the EMIS collect and analyse data that are necessary and sufficient to monitor and develop the national education policy framework and sector plan?

### 2.2.1 Main findings

The Education Data Repository has been approved with the intention of bringing together multiple systems and applications that contain various educational data. Through the repository, data from multiple systems and applications can be analysed collectively and displayed on the KPM Dashboard. The KPM Dashboard is designed with three main aims:

1. to enable data to be reported in a visual and interactive form;
2. to facilitate monitoring and evaluation of the Ministry of Education's programmes; and
3. to increase transparency and accountability through the reporting of data on the Dashboard.

While the KPM Dashboard has become an essential tool to monitor and inform the development of the national policy framework and sector plan, access to the Dashboard is highly restricted, being available only to key personnel at the Ministry of Education, state education departments, and District Education Offices.

Access to data is not only important for monitoring of the national education policy framework and sector plan, but also for other levels of management and for planning purposes at the schools, and district or state education offices. Actors at the school, district, and state levels should be able to view relevant information for their purposes on the Dashboard, and should be able to compare their own district, state, or school against national norms and expectations for each indicator in the education sector plan. This would help schools, districts, and states to identify their status and development requirements, and would assist development planning and monitoring at each level of government.

### 2.2.2 Recommendations (1.02)

Recommendation 1.02.1: Widen the access to the KPM Dashboard beyond key personnel and allow administrators from national, state, district, and school-community levels to access data at the relevant level across multiple systems and applications in the repository, and ensure Dashboard indicators are relevant to each person viewing them. Ensure additional financial resources to increase the number of software licences to enable broader access of the KPM Dashboard, or deploy via software which is open licensed, such as exporting relevant information to a MySQL database (warehouse).



## 2.3 (1.03) Does the EMIS collect and analyse data required for monitoring SDG targets and indicators?

### 2.3.1 Main findings

The Ministry of Economic Affairs has been assigned as the lead organisation to oversee the assessment of the SDGs in Malaysia and the Department of Statistics, Malaysia has been assigned as the lead coordinating body on data. For SDG 4 on Quality Education, this goal has been entrusted to the Ministry of Education and a taskforce has been established within the ministry to review the indicators, data sources, and data for SDG 4.

In 2018, the Department of Statistics, Malaysia published an initial assessment of the SDG indicators for Malaysia, outlining all the indicators across the 17 SDGs and 169 targets, specifically on the availability of data, disaggregation level, frequency of data, and source of data.<sup>49</sup> For Malaysia, 118 of the 244 indicators are readily available, 55 of them are partially available, 36 need to be further developed, while 23 are not available and 12 are not relevant to Malaysia.

For SDG 4 on Quality Education, there are 11 global indicators. Out of the 11 global indicators, 55% are available, 36% are partially available, and 9% need to be further developed. Of the 11 global indicators, there are 43 indicators for which the majority of indicators are available and gathered from administrative data of the Ministry of Education. The following are indicators which are partially available or not available:

<sup>49</sup> Department of Statistics, Malaysia (2018b) 'The Initial Assessment of the Sustainable Development Goals Indicators for Malaysia 2018', Department of Statistics, Malaysia, Putrajaya.

## Partially available:

- Administration of a nationally-representative learning assessment (a) in Grade 2 and 3; (b) at the end of primary education; and (c) at the end of lower secondary education [4.1.1].
- Proportion of children under five years of age who are developmentally on track in health, learning, and psychosocial well-being, by sex [4.2.1].
- Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex [4.2.2].
- Youth/adult educational attainment rates by age group, economic activity status, levels of education, and programme orientation [4.4.1].
- Parity indices (female/male, rural/urban, bottom/top wealth quintile, and others, such as disability status, indigenous peoples, and conflict-affected, as data become available) for all education indicators in this list that can be disaggregated [4.5.1].
- Participation rate of illiterate youth/adults in literacy programmes [4.6.1].
- Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education, and (d) student assessment [4.7.1].
- Percentage of students experiencing bullying, corporal punishment, harassment, violence, sexual discrimination, and abuse [4.a.1].
- Volume of official development assistance flows for scholarships by sector and type of study [4.b.1].

## Not available:

- Percentage of children under five years of age experiencing a positive and stimulating home learning environment [4.2.1].
- Percentage of students in primary education whose first or home language is the language of instruction [4.5.1].
- Education expenditure per student by level of education and source [4.5.1].
- Percentage of total aid to education allocated to countries [4.5.1].
- Percentage of students of a given age group (or education level) showing adequate understanding of issues relating to global citizenship and sustainability [4.7.1].
- Percentage of 15-year-old students showing proficiency in knowledge of environmental science and geoscience [4.7.1].
- Extent to which the framework on the World Programme on Human Rights Education is implemented nationally (as per UN General Assembly Resolution 59/113) [4.7.1].
- Number of attacks on students, personnel, and institutions [4.a.1].
- Number of higher education scholarships awarded by beneficiary country [4.b.1].
- Average teacher salary relative to other professions requiring a comparable level of education qualification [4.c.1].

The SDG 4 taskforce in the Ministry of Education is identifying ways to incorporate and develop the partially available and not available indicators. For instance, there are some indicators that can be added to the current systems and applications within the EMIS ecosystem, such as the home or first language of students or incidence of attacks and bullying. For the other indicators, specific systems or applications are required: for example, a specific assessment tool for global citizenship and education for sustainable development. The coverage of the EMIS ecosystem may also need to be extended to non-formal education and training, as well as youth – and even adults.

However, there are several key considerations for extending the systems and applications within the EMIS ecosystem:

- There are challenges with regard to clearly defining some of the elements referred to under the SDGs. For example, concerning SDG 4.2.2, non-formal education has not been adequately defined within the legislation and policy of education in Malaysia. For primary education the Professional Circular 14/2002 may need to be revised. For example, the definition of home schooling in Malaysia's legislation is significantly different from the actual practice of home schooling. In addition, schooling is traditionally used as a proxy for literacy by the Department of Statistics. Hence, the inclusion of non-formal education may require a redefinition of literacy.
- Several of the indicators not reported are defined in international standards as captured using surveys in which Malaysia has not participated, such as the Multiple Cluster Indicator Survey. It is not clear whether Malaysian survey tools have been adapted to the SDGs. The Household Income and Expenditure Survey is administered by the Department of Statistics and the National Health and Morbidity Survey 2015 is administered by the Ministry of Health. The jurisdiction of the Ministry of Education in Malaysia covers children from the age of five years old and above. Children below five years old are under the Ministry of Community Development. Therefore, participation in international surveys or data collection for these indicators will require stronger inter-ministerial coordination. The Ministry of Education should engage with the Department of Statistics and the Ministry of Health to improve the survey questions<sup>50</sup> to ensure they can adequately report on the SDG indicators aligned with household survey.
- There are challenges in regard to some indicators concerning the ways and extent to which global citizenship and education for sustainable development can be operationalised within the ministry data capture framework. While there are efforts to incorporate these elements as modules under civic education, as well as specific programmes in schools involving other partners, the reporting mechanism remains a challenge that needs to be considered more closely.
- There are issues concerning the integration of data to enable a holistic tracking of students' progress and development. There are several systems and applications involved in the tracking of students across different dimensions, such as academic achievement, co-curriculum activities, sports and physical education, family background, attendance, character (wrongdoing and commendable conduct), examination, reading assessment, and other related data. However, integration of all of these systems and applications into a single platform to track a student throughout his or her schooling is presently lacking.

## 2.3.2 Recommendations (1.03)

**Recommendation 1.03.1:** Review the requirements of the SDGs (particularly indicators, data sources, and data flow) to ensure they are adapted to the national context and included in the further development of a single EMIS under the ICT Transformation Plan 2019–2023.

**Recommendation 1.03.2:** Develop methodologies to capture SDG indicators on non-formal education, education for children with disabilities, and youth/adults, in the Malaysian context through the EMIS ecosystem.

**Recommendation 1.03.3:** The Ministry of Education should review the surveys being undertaken by the Department of Statistics and the Ministry of Health to strengthen data capture tools to ensure the SDG indicators requiring survey can be properly captured and reported.

50 The Household Income and Expenditure Survey and the National Health and Morbidity Survey

## 2.4 (1.04) To what extent does the EMIS capture data and information in ways that allow for equity analysis, such as enrolment/attendance of children with disabilities, children from ethnic minority communities, and children from poor households etc.?

### 2.4.1 Main findings

APDM is the main system within the EMIS ecosystem that captures the data and information about individual students that enable equity analysis. The data available in APDM include:

- information about parental incomes, verified by the relevant authorities, such as Village Heads and government officials (but not verified by the Inland Revenue Board);
- health records of students, administered directly by medical personnel from the Ministry of Health;
- attendance of students at school, entered daily by the class teacher;
- disability status, verified by the class teacher with relevant paperwork from the relevant authorities (disability status is based on a medical diagnosis by a certified doctor); and
- types of eligible assistance, such as food programmes or scholarships, based on parental income.

The Assistance Management Application is an add-on application that keeps records and reports on assistance for which students are eligible. APDM also captures information on ethnicity and sub-ethnicity, based on a classification provided by the National Registration Department.

The Ministry of Education plans to strengthen APDM for the verification of data on students eligible for assistance, especially concerning parental income, by linking the database with other governmental agencies, such as Inland Revenue Board, the Employees' Providence Fund, or the Social Security Organization. However, this initiative may face legal constraints concerning the extent to which these agencies can share individual information with the Ministry of Education. The initiative to strengthen APDM should also consider including languages and dialects spoken by the student at home, which is one of the missing sub-indicators for SDG 4.

It is important that the systems and applications in the EMIS ecosystem capture information on children learning through alternative modes of learning, such as the children of migrant workers and illegal immigrants. This information is presently not being properly captured.

There are also issues of access to data. For example, the headmaster/principal is the person who is responsible for verifying data in all systems and applications at the school level but they do not have easy access to the details on individual students. If a principal wants to access details concerning a student in his school, he/she has to request these from the teachers in charge of the different systems and applications. This may involve compiling data on each student by accessing APDM, e-attendance, SSDM (character), SAPS (academic records), PAJSK (co-curriculum records) and other student-related systems and applications. This information has to be manually combined with other information, such as the assessments of teachers who teach this student. Likewise, administrators at the district and state education offices must access multiple systems and applications to obtain relevant information for monitoring and planning. These inefficiencies are slowly being addressed through the Education Data Repository but progress is slow and the resources required to achieve full integration are limited.



## 2.4.2 Recommendations (1.04)

(Recommendations concerning the integration of systems and access by the school principal and teachers to student data are addressed elsewhere.)

**Recommendation 1.04.1:** Incorporate the first or home language of students as a student attribute in APDM, in line with SDG 4.5.

**Recommendation 1.04.2:** Initiate data-sharing agreements with related ministries and agencies for the purposes of sharing data on parental income between systems and applications, and to accurately capture data on children with disabilities.

**Recommendation 1.04.3:** The EMIS ecosystem should capture information on children learning through alternative modes of learning, such as the children of migrant workers and illegal immigrants.

## 2.5 (1.05) How, if at all, does the EMIS address issues around out-of-school children (including children at risk of dropping out)?

### 2.5.1 Main findings

As noted in Section 1.7.4, SSDM is the primary system that records wrongdoing by, and disciplinary issues relating to, students, as well as students' commendable character traits. SSDM has another crucial function, which is to serve as an early precaution/warning mechanism to identify, support, and guide at-risk children. A teacher can refer a student for counselling via SSDM, even for cases that do not involve disciplinary issues. For example, if the student has been absent from school for many days, regardless of whether this is



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with or without a reason, the teacher can refer the student for counselling and the counselling teacher will provide guidance or counselling, or even make a visit to the home of the student. This referral system also extends beyond those at risk of dropping out and can also include students with mental health issues and a tendency to commit suicide or who face family problems. SSDM also serves as the referral system for referring students with disciplinary problems for counselling. For example, when a student is truant and disciplinary action has been taken by the teacher, the student will automatically be referred to the counselling teacher for a follow-up.

Once the student has left a school, either through voluntary withdrawal or being expelled, the student's record in APDM will be temporarily deactivated. In this situation, only the discipline teacher, Senior Assistant for Student Affairs, and headmaster/principal can access the deactivated information. When the student is re-enrolled in another school, the student's record will be reactivated. The school has the responsibility to pass the name of any deactivated students to the Dropout Investigative Committee at the district level to determine whether the student has been re-enrolled in another school in the district. When the student cannot be found at the district level, their name should be passed on to the same committee at the state level, and finally to the national level. If the student has not been enrolled in another school or another institution of learning, such as vocational schools, then the student is considered to have dropped out.

However, it is important to note that the coverage of APDM only extends to schools and institutions of learning under the Ministry of Education. If a student moves to a private school or home school (non-formal), it will be difficult to track the student as the private school student system (SMIPS) is aggregated and there is no system for non-formal institutions to show where the student has moved.

Automated system alerts requiring attention by teachers and head teachers are also not implemented across the major systems and applications. There is only one automated system alert in the SPS and this is on infrastructure indicating the condition of the schools. Due to financial constraints, automated system alerts have not been developed for other components of SPS. Other systems and applications do not have automated alerts. Potentially useful areas where automated system alerts could be incorporated include:

- APDM e-attendance, enabling parents to receive a notification if the child is absent from school; and
- e-Operasi could include alerts if there is a teacher shortage in a school, giving the district or state education offices or Ministry of Education notice of the issue after a certain period of time.<sup>51</sup>

## 2.5.2 Recommendations (1.05)

**Recommendation 1.05.1:** The Ministry of Education should extend the coverage of APDM and other systems and applications beyond schools and institutions under the Ministry of Education, such as to students in private schools, as a tracking mechanism to address dropout, as well as include an archival function in the Education Data Repository, systems, and applications for schools, teachers, and students.

**Recommendation 1.05.2:** Enhance the systems and applications with the addition of automated system alerts, such as alerts to parents and teachers on student absenteeism; and alerts to district offices on facilities and equipment shortages.

## 2.6 (1.06) What are the various aspects that contribute to the quality of the EMIS?

### 2.6.1 Main findings

The EMIS ecosystem is comprised of different systems and applications which service the needs of actors at all levels of education. In general, the data are collected at schools and processed by responsible teachers. At least one teacher or an administrator in the school is assigned to be responsible for the system or application, with the headmaster/principal as the final point of verification of data for each school. A unique and permanent identifier is shared by each system or application for the school code, or IC number for individual teachers and students. However, there are cases, especially in relation to data on students, where the unique identifier is not the IC number but is instead derived from other documents, such as the birth certificate. There are also many cases of students who do not have an IC number, due to the student not being a citizen of Malaysia, being an undefined citizenship, or being a foreigner or stateless child. Due to the different unique identifiers that are used for students, and the large data volume required to store individual student records, the data may contain duplicate records of students, and may face issues relating to its accuracy, consistency, and completeness.

Respondents to this review expressed concerns about the accuracy, consistency, and completeness of EMIS data. They partially attributed these concerns to the disparate and incompatible array of different systems and applications at the school level, which may result in errors and mistakes in data. Prior to 2015 a single person, called the Data Teacher, was the focal point in each school on all matters pertaining to data. However, currently there are several teachers who each have responsibility for different systems and applications. Errors in data accuracy, consistency, and completeness result from the lack of interoperability between systems and applications, as well as from having different teachers responsible for different systems.

<sup>51</sup> Under the current system, if there is a shortage, schools must manually make a request to the District Education Office for replacements.

Issues of data accuracy, consistency, and completeness also resulted from the migration of student data from MS Access to APDM. The systems and applications that extract data from APDM face the issue of duplicated student records, even for those with the same IC number.<sup>52</sup> The division that manages APDM has responded to this issue by ensuring an annual cleaning exercise during which all data in APDM are printed out in MS Excel and manually verified for each entry. By April 2019, there were only 28 duplications detected in the system.

Although the Education Data Repository brings together data from 12 systems and applications, there are three main systems that contribute to the core of data, namely schools, teachers, and students. This is an inefficient structure requiring the gathering of data that have been processed and cleaned up respectively by different divisions using different systems. A common database that serves as the foundation of all education data to be extracted to all systems and applications in the Ministry of Education would help reduce duplication and redundancy, and improve integrity.

A single integrated database would also overcome the problem of multiple unique identifiers leading to the duplication of student and staff data. It would help ensure an accurate count of students and teachers. This would also enable students who are not in schools and institutions of the Ministry of Education to be tracked, as well as teachers who are based in the Ministry, state, or district education offices.

A single integrated database would also reduce the duplication of work at the school level which results from multiple systems and applications. The development of a common database can help facilitate extraction of information from the National Registration Department and this can be cleaned up in the school by an administrative assistant under the supervision of the Data Teacher.

## 2.6.2 Recommendations (1.06)

**Recommendation 1.06.1:** Establish a common database and assign unique identifiers that are permanent for schools (school ID), teachers (National Registration IC), and students (student ID), with common coding and data standards, as outlined in the ICT Transformation Plan. This common database will hold the basic information to be extracted to all systems and applications, to avoid duplication and redundancy.

**Recommendation 1.06.2:** Develop common standards for the registration of students without documentation, either in the form of school ID + auto-generated student number or a 12-digit ID with the National Registration Department, rather than using a birth certificate, passport number, or the reference number on the paperwork relating to the students.

<sup>52</sup> For example, the aggregated enrolment was 5.2 million prior to the migration of data but after migration the enrolment for individual students was 4.9 million students. Hence, it was estimated that there were at least 300,000 duplicated students in APDM prior to the migration.

## 2.7 (1.07) What (data) quality assurance processes are in place and how effective are they?

### 2.7.1 Main findings

The main data quality assurance process for some of the major systems, such as e-Operasi, takes the form an 'error' indication system (*utiliti ralat*). The 'error' indication system functions like a traffic light warning system, showing an error when there is a mismatch of data such as having resulted from the comparison of different indicators. The 'error' warning will then flag up when the total number of teachers does not match the total number of posts allocated to the school. When the 'error' is displayed, the teacher in charge of the system will have to amend the data – failing which, the officer at the District Education Office will highlight to the school that action needs to be taken.

The Director General of Education, as the Chief of the Educational Service, has full authority to instruct teachers and administrators in schools to comply with data entry requirements, and issues circulars and instructions to this effect. Hence, the completion of data for these systems and applications can be considered mandatory for all the schools under the jurisdiction of the Ministry of Education.

An audit of the EMIS ecosystem was recently carried out, led by a private consultant with the Performance and Delivery Unit. However, most systems and applications are not subject to independent audits or 'spot checks'. Even where there was previously a 'spot check', such as those carried out by the Inspectorate of Schools Division on the SKPMg2, this audit practice has been discontinued since July 2018 due to the backlog of documentation at schools. Hence, the only form of audit is ensuring that the evidence for the scoring of each indicator of the standards is appropriate.

The divisions managing the systems and applications do not conduct field work in the form of 'spot checks' and are fully reliant on the error indication system. However, other divisions which are classified as users of the data may decide to conduct field checks before incorporating the relevant data to inform their processes. For example, the Procurement Division manages the procurement of assets and tender applications for schools visits prior to authorising procurement. Since late 2018, the Procurement Division has permission to access information about schools through the SPS system and since April 2019 has been visiting schools to conduct 'spot checks' on the accuracy of the data, before fully adopting the data to inform procurement and tender applications. Another example is the Examination Syndicate, which extracts student data from APDM for the various examination registration systems to undertake an internal process to audit and clean the data before the extracted student data can be used in the registration systems.

### 2.7.2 Recommendations (1.07)

**Recommendation 1.07.1:** Enhance overall interoperability of administrative data systems by integrating the EMIS with the systems and applications in other ministries and agencies, including the Ministry of Health and the national birth registry, via a unique identifier, in line with the ICT Transformation Plan, to clean and verify data.

## 2.8 (1.08) How does the EMIS protect the data privacy of students and teachers?

### 2.8.1 Main findings

Overall, the information in systems and applications is classified as confidential and cannot be shared without permission. Legislation exists to protect the rights of individuals. Malaysia has enacted the Personal Data Protection Act 2010 (PDPA), but this act only regulates the processing of personal data in commercial transactions. As a whole, the act does not prevent the collection of data for educational purposes by the Ministry of Education, as long as the data are not used for commercial purposes.

Therefore, the multiple systems and applications require multiple logins and passwords. Each of the systems and applications was established on different platforms and with different levels of sophistication in terms of data protection and security, which has resulted in concerns about the security of confidential information and the safety of the entire EMIS ecosystem of the Ministry of Education.

SAPS is the system that stores students' examination records and it is accessible to parents. The security features for SAPS were previously not as extensive as those of other systems and applications, which have been professionally developed; however, they have recently been enhanced. The login system for parents accessing SAPS has been made more sophisticated by requiring the child's IC number, the exact name of the school, and the location of the school in terms of district and state. This upgraded login has avoided the use of a computerised login, but does not necessarily enhance the overall security of the system. Thus, the plan is now to migrate the module for parents to the Malaysian Government Online Services (MyGOS), which currently houses many systems and applications of various ministries and government agencies. The planned migration is expected to be completed by the end of 2019.

The migration of systems and applications of the Ministry of Education to MyGOS is not only limited to SAPS. Those systems and applications that are intended to be accessible by the general public, parents, or students are being considered for access via MyGOS. For example, the SPM examination, which is currently undertaken through the SPPAT system, may change to use MyGOS for the release of SPM results. The MyGOS gateway is a portal established specifically for public access and has a higher level of sophistication in terms of its security and capacity.

### 2.8.2 Recommendations (1.08)

**Recommendation 1.08.1:** Identify the systems and applications that are intended for public access, especially by parents, to be housed under the MyGOS gateway, which provides robust security features to protect data. Also consider a single Ministry of Education portal as envisaged in the ICT Transformation Plan, with unique, centralised, and permanent user identities and passwords for parents for all Ministry of Education online services.

**Recommendation 1.08.2:** Develop a portal for parents to communicate with teachers and to receive information on a child's status, attendance, and learning outcomes.

**Recommendation 1.08.03:** Develop a policy on the protection of data on individuals for the Ministry of Education.





## 2.9 (1.09) How does the EMIS interact, if at all, with other administrative data systems (e.g. health, social welfare, civil registry, labour etc.)?

### 2.9.1 Main findings

In 2018, the Education Data Repository has carried out exchanges of data with databases of key governmental agencies. These governmental agencies include:

- the Malaysia Central Government Data Exchange, MAMPU, in the Prime Minister's Department;
- the Central Criminal Intelligence Unit of the Royal Malaysia Police;
- Public Sector Open Data, MAMPU;
- MyIdentity, of the National Registration Department;
- the Human Resource Management Information System (HRMIS), of the Public Service Department; and
- PLAN Malaysia (Town Location), of PlanMalaysia.

Apart from the repository, as elucidated earlier, systems and applications that are intended for public access, such as SAPS and SPPAT (for announcement of SPM results) have begun to collaborate with MAMPU to access the MyGOS gateway.

The Students Health Records portal in APDM is also linked to the Ministry of Health. Unlike previously, where the Health Record Book for every student was kept in schools, beginning in 2019, medical personnel who visit schools for immunisations and basic checkups will be recording each student's health status directly in the portal in APDM. A teacher will only need to fill in the student's height and weight in their health records.

## 2.9.2 Recommendations (1.09)

**Recommendation 1.09.1:** Establish agreements with related ministries and agencies – including the Ministry of Health, the Ministry of Women, Family and Community, and the Department of Social Welfare, Department of Statistics – for the purposes of sharing data between systems and applications on parental income, and to accurately capture data on children with disabilities and applications that deal with child development.

**Recommendation 1.09.2:** Develop data-sharing agreements with related ministries and agencies (Ministry of Human Resources, Department of Statistics, etc.) for the purposes of sharing data between systems and applications that deal with adult lifelong education and training.

**Recommendation 1.09.3:** In the longer term, the Ministry of Education and other ministries should work jointly to develop a national registry of citizens which indicates the status of each citizen in the receipt of age-related essential services. This system should be searchable at the service delivery point, such as the school or health facility, to ensure the referral of any citizen who is not obtaining an essential service that is appropriate to their age. It should also be used to identify issues requiring special treatment, such as disability status.

## 2.10 (1.10) How is the EMIS managed and where is it situated in the data architecture or statistical systems of the country?

### 2.10.1 Main findings

The EMIS ecosystem and the Education Data Repository are currently part of the Ministry of Education's data architecture. The Ministry of Education has a dedicated Data Centre, commonly referred to Pusat Data Enstek (Enstek is the township where the centre is located).

The Public Sector Data Centre (PDSA) is an initiative under MAMPU to provide a centralised data centre services for governmental agencies. Under PDSA, five main services are provided: hosting of the physical and virtual servers; data centre services; a gateway virus wall; backup and restore functions; and support services. The long-term plan is for some applications to be hosted at the Pusat Data Enstek of the Ministry of Education or at PDSA. The framework of the ministry's data centre has been developed in line with PDSA to prepare for the future migration, or if there is a requirement to host the application at PDSA.

All ministries, including the Ministry of Education, are responsible for submitting data to the Malaysian Department of Statistics. The Department of Statistics is to be the leading statistical organisation in Malaysia by the year 2020. It hopes to achieve this through the implementation of the Statistical Strategic Plan 2015–2020. However, the Department of Statistics only receives summary statistical information for education. Detailed statistical information is available only from the Ministry of Education, and standards for education data are also determined and enforced through the Ministry of Education.

## 2.11 (1.11) Are there sufficient resources (human and financial resources) available for the EMIS?

### 2.11.1 Main findings

The ICT Transformation Plan has comprehensively mapped out the current situation of the EMIS and the ICT environment in the Ministry of Education, as well as the proposed future development for both over the next five years. This has a direct impact on the EMIS ecosystem. The successful implementation of the 27 initiatives will rely on successfully integrating, simplifying, and strengthening the EMIS ecosystem.

Financial resources are one of the crucial constraints that could hinder the timely achievement of the ICT Transformation Plan. The major source of finance available is the operational expenditure allocated to the Information Management Division. Without dedicated and continuous capital expenditure allocated for development, it may be a challenge to implement the necessary reforms.

Despite encountering constraints in relation to the available financial resources, the ICT Transformation Plan is expected to address and overcome the challenges associated with human resources, especially concerning the support of experts dealing with ICT and the systems and applications in the EMIS ecosystem. One of the initiatives of the plan is to pool the applications, and application development and maintenance, under an integrated system at a single location. This initiative will consolidate the experts into a single group and avoid the duplication of expertise. Importantly, the technical support for various systems and applications can also be grouped together to ensure the smooth running of the ecosystem.

The ICT Transformation Plan defines the whole information system of the Ministry of Education, ranging from applications to databases to storage of data, all within one framework. This framework is intended to serve as the guideline for the future development of ICT in the ministry. This will reduce or eliminate the current practice of system technology platforms being vendor-driven, whereby different systems and applications were developed using the preferred platform of each selected vendor. The single framework will harmonise all the systems on a single platform, which will facilitate data-sharing and consolidate the required expertise to ensure smooth management of the systems and applications.

At the school level, the responsibility for managing the various systems and applications has been placed on teachers. Prior to the separation of different systems in 2015, the Data Teacher was in charge of data management for each school. A Professional Circular stipulated that the teaching load of the Data Teacher be reduced. However, as there are now several teachers involved in managing each system and programme, the reduced teaching load is no longer implemented. The responsibility for data management for each system is now an additional load for each teacher, in addition to their teaching responsibilities. Integrating and consolidating the systems and applications can reduce the duplication of work relating to data management. However, consideration should also be given to creating an administrative assistant position, with responsibility for assigning manual work, such as keying in or maintaining basic information, to be given to a clerical assistant.

### 2.11.2 Recommendations (1.11)

Additional recommendations not noted already include the following:

**Recommendation 1.11.1:** Create a clerical/administrative assistant position to manage basic data across the EMIS systems in each school to help reduce the workload of teachers.

## 2.12 (1.12) Is there an annual budget allocation to improve the EMIS?

### 2.12.1 Main findings

The division or department responsible for each system is currently the owner of each system and therefore maintaining or improving each system is the responsibility of the respective division or department. Maintenance or improvement must be undertaken with the operational expenditure budget allocated to the respective divisions.

For hardware and infrastructure improvement, the budget allocation is derived from the operational expenditure budget allocated to the Information Management Division. This includes the maintenance of the data centre and security requirements that are common across all hosted systems and applications.

## 2.13 (1.13) Do parents and teachers have access to EMIS data and they these data result in improved pedagogical outcomes?

### 2.13.1 Main findings

The Education Data Repository is accessible by key administrators of the Ministry of Education. Access to the dashboard of the repository is limited and is secured by a password.

For each of the different EMIS systems, access to view and modify the data is granted to each officer based on that officer's official responsibilities and geographic location. For example, the officer in the State Education Office has full access to the data of all the schools in that particular state. Likewise, the officer in the District Education Office only has full access to the data of all the schools in his/her district.

The teacher in charge of each system or application has access to the system or application under their mandate. The headmaster/principal is the only person who has access to all the systems and applications at the school level. Even the Senior Assistant for Administration, Student Affairs or Co-Curriculum, only has access to the specific systems and applications that are under his/her responsibility.

Teachers, in general, only have access to specific sections of the systems and applications relevant to their responsibilities. For instance, class teachers have access to the attendance of their classes, while teachers have access to the SAPS in relation to the students they teach for each subject. Teachers also have access to view their details in the e-Operasi system, and are required to verify these details four times a year.

Parents only have access to the SAPS to view their child's results.

Across the EMIS ecosystem, most of the data gathered through the systems and applications are not accessible by teachers and parents, and, importantly, do not contribute to improved pedagogical practices and learning outcomes in the classroom. As highlighted earlier, there is a lack of consolidation at the school level across these different systems and applications. A consolidated dashboard or monitoring tool available at the school level would help teachers consolidate and use the data contained in each of the separate systems.

Although there are multiple systems and applications in the EMIS ecosystem, there are relatively few systems and applications that directly capture data for the improvement of pedagogical outcomes. It is claimed that SAPS is the most useful for teachers because using SAPS, teachers are required to set targets for every student based on their previous performance.

According to teachers, the systems and applications in the current EMIS ecosystem are predominantly intended for the management and monitoring of schools by the district offices and central ministry. The systems and applications are developed mainly to facilitate the processes and information needs of the Ministry of Education, rather than those of schools themselves. Applications that can support and enhance pedagogical outcomes are more likely to be developed with strong reference to the needs of actors at the school level, such as teachers and parents.<sup>53</sup> The EMIS ecosystem lacks applications and systems built for the needs of teachers that may be used to improve pedagogical outcomes.

### 2.13.2 Recommendations (1.13)

**Recommendation 1.13.1:** Identify good practices in the form of useful functions and feedback loops that support holistic education delivery and improve learning outcomes, and subsequently adopt and introduce these applications and systems across the country. Examples include informative ways of feeding back examination results to teachers to enable action to take place to ensure pedagogical improvement.

## 2.14 (1.14) What were the key drivers, processes, challenges, and costs of the transition from aggregate data systems to individual child systems?

### 2.14.1 Main findings

Before the EMIS system was divided into separate systems, the student module was an aggregated system of student data. APDM, which contains individual student data, was developed separately from the old EMIS. Prior to APDM, individual student data were recorded offline in an MS Access format at the school level. The database of schools was then combined at the district level, and subsequently at the state and national levels.

The key driver of APDM was the need to collect individual student data under NKRA. Hence, APDM was developed in 2012 and experimental roll-out in six states in 2013, the system was introduced in 2014.

One of the biggest challenges in developing the individual student system was ensuring the accuracy of the individual student data. Due to the migration from the offline MS Access database to the current platform, there was significant duplication of approximately 300,000 individuals. After several rounds of clean-up, to date only 28 duplications have been detected in the system.

<sup>53</sup> For example, a teacher that was interviewed shared information about an initiative in another school within the same district which has developed an application to keep track of students' homework. This application was developed by a private vendor and was funded by the parent-teachers association of the school. When the teacher assigns homework to students in a particular class, the teacher will record the homework in the application, and all parents have access to the list of homework after school. Through the application, parents can partner with the teacher to ensure the students complete their homework, and at the same time, it allows parents to provide direct feedback to the teacher. Such an application, which can improve pedagogical outcomes, requires inputs from the teachers and has to be developed from the bottom up in order to meet the needs of teachers, students, and parents – and, importantly, for the application and system to be effective.





## 3

# Data analysis and utilisation

## 3.1 (2.01) To what extent are the EMIS data accessible to intended ministries and public?

### 3.1.1 Main findings

The Education Data Repository contains 12 systems and applications accessible through the Ministry of Education KPM Dashboard. The Dashboard is accessible only by the top management of the Ministry, including the Minister of Education, the Director General of Education, the Secretary General of the ministry, and several other key managements. The KPM Dashboard and the Education Data Repository is not accessible to other education stakeholders.

For other individual systems and applications, the functions and data are accessible to the owners of each system at the ministry entity<sup>54</sup> and can be granted at the state and district levels, as well as being accessible to the headmaster/principal at the school level based on the role of each actor. Each person only has access to data on their respective region or institution (school).

Parents only have access to SAPS, which holds the examination records of their child. The public and community have no access to information about schools, with the exception of being able to access aggregated national and state data published by the Ministry of Education in their annual statistics book. These data are not published in an appropriate format to have meaning for the community but they do help the media and public agencies to report on the education system.

### 3.1.2 Recommendations (2.01)

**Recommendation 2.01.1:** The Ministry of Education should develop a school report card which is accessible to the public. The school report card can provide stakeholders with critical information on the school, which can help increase advocacy for change and community involvement in the local school.<sup>55</sup>

**Recommendation 2.01.2:** Develop a communication strategy for EMIS data which details how the Ministry of Education can communicate the data in the EMIS ecosystem to the media, public, and community stakeholders.

<sup>54</sup> Division, department, or office.

<sup>55</sup> An example of a comprehensive school report card can be found at: [www.illinoisreportcard.com](http://www.illinoisreportcard.com)



## 3.2 (2.02) How are the EMIS data interpreted, analysed, presented, and consumed for decision-making and policy implementation?

### 3.2.1 Main findings

The Education Data Repository can provide descriptive, diagnostic, predictive, and prescriptive analysis of the data contained within the Repository. Analysis of the data can determine trends and patterns in education. The analysed data in the Repository can be presented visually through the KPM Dashboard. The Dashboard serves an important function by providing up-to-date data for decision-making and policy implementation. For instance, the top management has access to the Dashboard and uses the data for monitoring and determining education policy.

The data derived from the repository are used to inform decision-making and policy. For example, data are analysed and used to inform parliamentary debates on education policy. When questions are raised in parliament concerning education, such as shortages of teachers in specific areas or subjects, the Minister and officials provide answers based on information that is accessible on the KPM Dashboard. Analysed data are also a major source of statistical data within the Ministry to make decisions on resourcing to districts and schools, as well as to guide policy and policy implementation.

## 3.3 (2.03) How are the EMIS data used to improve/influence the implementation of sub-national education plans at district and school levels?

### 3.3.1 Main findings

At the sub-national levels of state and district, the systems and applications in the EMIS ecosystem are used for monitoring. The systems and applications also provide empirical evidence for the implementation of education, resourcing, and monitoring in schools. For example, through SPS, the district and state education offices are aware of the condition of schools, school facilities, and infrastructure, and can determine which require improvement. e-Operasi provides information on which schools have an excess or shortage of teachers, and in which subjects.

However, in practice, the use of data from the EMIS systems and applications for planning occurs on a limited basis. Individual schools still need to write manually to the District Education Office to request teachers, facilities, or repairs. There is no automated warning system, except for the infrastructure component in SPS, which can alert administrators at the sub-national levels to likely problems in schools.

At the school level, most of the systems and applications in the EMIS ecosystem are used for compliance and reporting purposes only.

### 3.3.2 Recommendations (2.03)

Recommendations have already been included in previous sections.



## 3.4 (2.04) How does the EMIS facilitate daily transactions for operational requirements?

### 3.4.1 Main findings

The two major systems, APDM and e-Operasi, include a facility for daily transactions. The e-attendance function in APDM tracks students' attendance on a daily basis. Class teachers are required to enter student attendance daily using a computer or mobile phone. Reasons for absenteeism must also be recorded. APDM then provides these data to other systems and applications involving students, such as SAPS, PAJSK, and examination registration. As mentioned earlier, APDM also feeds into SSDM and referrals for student counselling.

e-Operasi also has a function to track the whereabouts of teachers who have additional duties outside of the school. The tracking is carried out daily in the e-Operasi system, and is recorded by the Senior Assistant for Administration or the administrative assistant in the school. The e-Operasi system is further linked to the HRMIS of the Public Service Department and contains detailed individual information about teachers.

e-Operasi is the main system that provides data for decision-making, such as for staff planning in schools. The data tracks individual teachers throughout their career. Data in e-Operasi are also used to feed into the e-Promotion (e-Pangkat) and Teachers' Transfer System (e-GTukar) applications, which manage the promotion and transfer of teachers. Promotion, transfer, and other individual records of the teacher will then be updated in e-Operasi.

### 3.4.2 Recommendations (2.04)

Recommendations have already been included in previous sections.

## 3.5 (2.05) How does the EMIS operate with various systems and functions, e.g. student tracking (students' movement, transition, transfer etc.), real-time monitoring (attendance, academic progress etc.), early warning (dropout prevention, learning improvement etc.), and automated reporting with data visualisation and feedback loops (e.g. school report cards)?

### 3.5.1 Main findings

APDM is the main system used for tracking students and monitoring student attendance. As elaborated earlier, APDM keep records of students' attendance as well as students' movement and transfer across public schools.

The Education Data Repository has also established an early warning system for students at risk of dropout, based on seven indicators across the various systems and applications. These include attendance, academic achievement, student character assessment, disability status, household income, home/house distance from school, and status of parents/family. These indicators are tabulated into an index which indicates the risk factor for students dropping out. A list of students with different risk levels (high, medium, or low) in relation to dropping out is given to the District Education Office via the KPM Dashboard. The headmaster/principal, Senior Assistant for Student Affairs, and counselling teacher in the school are notified of their students who are high risk, for early intervention to be carried out. The reason that the list is not accessible by schools via the KPM Dashboard is the restriction in terms of the number of user licences.

In terms of learning improvement, such functions are partially and indirectly embedded into SAPS, where teachers must input the expected results for each student based on the student's past performance. SAPS also holds the academic electronic report card for students, which is accessible by parents. Apart from this, there is no system or application that keeps track of academic progress and that can be used for the improvement of pedagogical outcomes.

As noted above, the KPM Dashboard is not accessible beyond the district education office and therefore the use of infographics and other data visualisations at the school level is limited.

### 3.5.2 Recommendations (2.05)

Recommendations have already been included in previous sections.



## 3.6 (2.06) How is the EMIS used, if at all, to help ensure equitable distribution and allocation of resources (e.g. school grants, teachers etc.)?

### 3.6.1 Main findings

There are two types of grants disbursed by the Ministry of Education.

One method involves student grants for students in need, including underprivileged students. APDM is the main source of data used to determine the eligibility of students for these grants. Family background and parental income are the main indicators used by the schools to determine the eligibility of students to receive scholarship and to be considered under the Additional Food Programme. At the school level, the Senior Assistant for Student Affairs bases eligibility on information contained in APDM. The Welfare Committee endorses the eligibility of students and information is submitted to the Financial Division for the disbursement of grants. Students who receive grants and aids are then registered in the Assistance Management System, which keeps track of the allocation disbursed to the students. Due to the reliance on data found in APDM, there has been consideration of the idea of supplementing data on parents' income with other national databases, such as e-Kasih under the Ministry of Finance (a database of the bottom 40% who qualify for national assistance and aid), the Inland Revenue Board, the Employees Providence Fund, or the Social Security Organisation. Students who do not submit the relevant paperwork on parental income for APDM are not considered for assistance and aid under the Ministry of Education.

The Ministry of Education also provides school grants, also known as general assistance grants. There are three components of general assistance grants for schools:

- **a per capita assistance grant** – a formula grant calculated based on the number of students in each particular subject (intended to support teaching and learning activities);
- **a sports in school assistance grant** – for sports activities; and
- **an additional schooling assistance grant** – special fees for the school to support co-curriculum activities, examination, and insurance for all students (only for Malaysian citizens).

These general assistance grants are intended to support the schools in teaching and learning activities. The grants are calculated based on a formula which includes the number of students in the school with a breakdown according to subjects, nationality, and other students' data. However, instead of getting the data from the systems and applications within the EMIS ecosystem, the Financial Division of the Ministry of Education still relies on manual forms. Schools must submit a detailed manual form of approximately eight pages in length by 1 October and 1 June to the District Education Offices and to the state and Ministry of Education. The grant allocation is then be disbursed in January and August, directly from the Ministry of Education into the schools' bank account.

The use of the EMIS data for the allocation of facilities and teachers has already been discussed.

### 3.6.2 Recommendations (2.06)

Recommendations not already noted include the following:

**Recommendation 2.06.1:** Include the variables used for the calculation of school grants in APDM and related systems and applications, to allow the general assistance grant to be calculated, disbursed, and remitted directly, thus eliminating manual and duplicated work. This will require integrating the financial system used for the remittance of grants and assistance with the accounting module in Sistem Pengurusan Sekolah.

## 3.7 (2.07) What are some key requirements and issues to consider in order to ensure better collection, analysis, and utilisation of the EMIS data?

### 3.7.1 Main findings

The EMIS ecosystem within the Ministry of Education is complex, with many systems and applications lacking integration and connectivity with each other. The Education Data Repository aims to consolidate education data across different systems and applications. However, while the Repository brings together data from various systems and applications that allows more comprehensive analysis to be carried out, there is still a lack of consistency in terms of the procedure to ensure the quality and accuracy of data in each system and application on its own. The ICT Transformation Plan will provide an integrated EMIS system on a single platform.

As noted, the analysis and reporting of data across the systems and applications in the EMIS ecosystem is only available to the top management. While the KPM Dashboard has been well received and has contributed towards decision-making and policymaking at the Ministry of Education level there is a need to extend the usage of the Dashboard to the Repository across the various sub-levels, from the state to district, and, importantly, to the school and classroom.

At the school level, data submission across the systems and applications is still perceived as a form of monitoring and auditing. A paradigm shift is required at the school level to appreciate and make use of data for self-evaluation/assessment. Importantly, teachers and administrators in schools have not been provided with access to analysed data and therefore their capacity to interpret and use data to affect the administration of their schools and pedagogical outcomes is limited. The future development of systems and applications must be geared towards supporting the teaching and learning practices in classrooms, and in this respect, inputs into future iterations of the software are required from teachers and parents. SAPS is an example of a system developed with the requirements of the school actors taken into account. Changes to existing systems and applications should cater to the needs of the actors and stakeholders at the school level, to help enhance pedagogical outcomes.

### 3.7.2 Recommendations (2.07)

**Recommendation 2.07.1:** Reduce the number of systems and applications that are intended for reporting and monitoring purposes, especially those which do not necessarily contribute to improved pedagogical outcomes

**Recommendation 2.07.2:** Introduce capacity building in the form of in-service training for teachers and administrators at school level to assist in improving the analysis and interpretation of the EMIS data, and, importantly, for data to influence and improve the practices and development in schools and classrooms, with the end goal of improving pedagogical outcomes.





# Annex A

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## Annex B Persons interviewed

The following persons were consulted as part of this review.

Person/position	Department/institution/organisation
Six officers	EPRD, Ministry of Education
Four officers	School Management Division, Ministry of Education
Six officers	Information Management Division, Ministry of Education
Two officers	Finance Division, Ministry of Education
Three officers	Procurement Division, Ministry of Education
One officer	Inspectorate of Schools, Ministry of Education
One officer	Examination Syndicates, Ministry of Education
Five teachers and administrators	Secondary school
Three teachers and administrators	Primary school
One administrator	Pre-school
One officer	Public university
Two officers	SDG 4 Taskforce, Ministry of Education



## Annex C

# List of systems and applications in EMIS ecosystem

These systems and applications were identified through a stock-taking exercise by the Ministry in 2015–2016 and are divided into operations, back office, and services. The names of the applications are translated by the author.

### **Operations**

- School Management Module (SPS)
- Teacher Information System
- e-Release
- Student Information System (APDM) (divided into attendance, support management, primary e-registration, secondary e-registration)
- EMIS for Schools (divided into EMIS Sports Facilities, EMIS Equipment, EMIS Immovable Assets)
- e-Operation for Teachers (School Operational System)
- NKRA (National Key Result Areas) National Main Cleanliness Area
- Smart School Qualification System
- Hostel Management and Monitoring
- Hostel Food Supply
- Hostel Daily Performance Data
- Hostel Instruments
- Daily Hostel Transformation 2013–2020
- Textbooks Management System
- National Pre-school Quality Standards
- National Information System for Pre-school
- Malaysian Education Quality Standards (SKPM) (formerly e-Inspectorate)
- KPM Performance Dashboard
- School Security Grading System
- Pentaho Open Source Business Intelligence
- Special Education Consolidated Information Centre
- Student Career e-Profile
- Boarding School Offering and Monitoring of Student Registration Application
- Special Individual Student Education Programme
- Application for Student with Special Needs to Form 1 and 4 in Special Education Secondary Schools
- Online Examination Registration System (SPPAT)
- e-Suggestion
- Student Character System (SSDM) (formerly Student Discipline and Wrongdoing System)
- Disciplinary Issue and Education Reporting
- UPSR (Standard 6) Examination Registration System
- UPSR Trial Examination Marks Entry System
- UPSR Coursework Marks Entry System
- Form 3 Assessment System
- e-Sarana (for Parents Teacher Association Activity)
- JQAF (Jawi, al-Quran, Arabic and Fardhu Ain) (an approach for Islamic education)
- Physical Activity, Sports and Co-curriculum Assessment (PAJSK)

**Back office**

- Human Resource Management Information System (HRMIS)
- HRMIS Annual Performance Evaluation Report
- Disciplinary
- INSYST Application (developed by Institut Aminuddin Baki, the educational management institute)
- Association for Wives of Public Servants and Women in the Public Service (PUSPANITA)
- Malaysian Grid for Learning
- One government financial management accounting system
- MySPATA Fixed Asset Management System
- e-Graduate (New Teachers Recruitment and Placement System)
- Bachelor of Management Programme
- e-Promotion
- e-GTukar (Teachers' Transfer System)
- e-Profile
- Appointment of Asset Officer System
- Staff Activity System
- KPM Training Management System
- e-Doket
- SPA Non-Fixed Asset Management System
- Civil Service Examination System
- Online Promotion Result Check
- Malaysian Pension System Induction Course
- e-AP58 System
- Monitoring of Asset Management System (d62)
- Monitoring of Asset Management System (d63)
- Electronic Funds Transfer and Cheque Cancellation List
- Value Audit Management System
- School Fund Accounting System
- Teacher Management Replacement Plan Module
- Teacher Education Division Document Management System (e-Pendora)
- Finance Division Student Support Management Application
- Bill and Claim Payment Performance Reporting System
- Online Application for Federal Teaching Scholarship to Pursue Bachelor's of Education Programme in Public Higher Education Institutions

**Services**

- Controlled School Application
- Online Application into Form 1 of Boarding School (SPAT1)
- Online Application into Form 4 of Boarding School (SPAT4)
- Online Application for Federal Training Award Scholarship
- Online Application for Matriculation programme
- Online Registration System
- Application into KPM Matriculation programme
- Online Application for Standard 1
- Application System for Students Applying to KPM Art Schools Malaysia
- Art Education Score Entry Application
- Art Education Score Entry Application for PT3 Examination
- STAM (Malaysian Higher Religious School Certificate) Online
- UPSR (Standard 6) Coursework Entry System
- e-Gerak Islamic Education Sector, Melaka State Department of Education
- Online Standard 1 Student Management System, Selangor State Department of Education
- Standard 1 Student Entry Application System
- SPM (Malaysian Certificate of Education) (U) Online
- e-Application for Pre-school
- Lower Form 6 Student Placement Management System
- School Examination Analysis System (SAPS)
- Co-curriculum Marks Gathering Application
- Subjective Marks Entry System
- Student Admission into Vocational College and Technic Secondary School Programmes for January 2016 Intake

## Annex D Review rubric

A review rubric is set out below to enable scaled comparisons between countries along different themes and is presented below.

**Table 4. Rubric for summary comparison of the review**

SN	Research question	Latent	Emerging	Established	Advanced	Comment
1.0	Strategic area: policy and data gaps					
1.01	Does the country have a strategic plan to strengthen the EMIS?	No strategic plan currently exists.	Strategic plans exist but they are fragmented between different agencies, lacking in quality or are not being implemented.	Strategic plans exist and are being followed but there are areas of funding, coordination, or implementation that require improvement.	Strategic plans exist and guide the EMIS.	Continuous funding to ensure implementation and infrastructure required for the plan. Alignment of plan across different divisions.
1.02	Does the EMIS collect and analyse data that are necessary and sufficient to monitor and develop the national education policy framework and sector plan?	The EMIS does not collect and analyse data for monitoring and development of the national education policy framework and sector plan.	The EMIS does collect and analyse data for some monitoring and development of the national education policy framework and sector plan but there are significant gaps and issues (quality, sector etc.).	The EMIS does collect and analyse data for most monitoring and development of the national education policy framework and sector plan but there are some gaps in terms of accessibility of the analysed data at the school-community level.	The EMIS does collect and analyse data for all monitoring and development of the national education policy framework and sector plan, and facilitates timely and quality monitoring and analysis.	Widen access to the analysed data to include school-community level.
1.03	Does the EMIS collect and analyse data required for monitoring SDG targets and indicators?	The EMIS does not collect and analyse data for the SDG targets and indicators and there is presently no mapping.	The EMIS does collect and analyse data for some SDG targets that the EMIS can provide information and indicators on, and there is mapping and a plan to ensure full coverage.	The EMIS does collect and analyse data for most SDG targets for which the EMIS can provide information and indicators on, and there is and there is mapping and a plan to ensure full coverage.	The EMIS does collect and analyse data for all SDG targets for which the EMIS can provide information and indicators on, and there is presently mapping.	SDG mapping to education data sources completed. Development of some indicators that are partially available or not available.

SN	Research question	Latent	Emerging	Established	Advanced	Comment
1.04	To what extent does the EMIS capture data and information in ways that allow for equity analysis, such as enrolment/ attendance of children with disabilities, children from ethnic minority communities, and children from poor households?	The EMIS does not disaggregate by equity parameters: regional, ethnicity, wealth, gender, disability, language etc.	The EMIS does disaggregate by some parameters of equity parameters: regional, ethnicity, wealth, gender, disability, language etc.	The EMIS does disaggregate by most parameters of equity parameters: regional, ethnicity, wealth, gender, disability.	The EMIS does disaggregate by all parameters of equity parameters: regional, ethnicity, wealth, gender, disability, language etc.	Other parameters to be developed: language, children learning through alternative modes of learning. Capacity to verify information, especially on eligibility of students concerning income data.
1.05	How, if at all, does the EMIS address issues around out-of-school children (including children at risk of dropping out)?	The EMIS is not used to address issues of out-of-school children or those at risk of dropping out.	The EMIS is used to address issues of out-of-school children or those at risk of dropping out but not often and there are significant gaps, and disaggregation and quality issues.	The EMIS is used to address issues of risk of dropping out but there are some gaps on direct access for schools and teachers, and the technical capability of the system.	The EMIS is used to address issues of out-of-school children or those at risk of dropping out, on a regular basis.	Widen access to the analysed data to include school-community level. Technical capability in terms of automated system alert and archival function.
1.06	What are the various aspects that contribute to the quality of the EMIS?	EMIS data fitness for analysis: relevance, accuracy, completeness, recency and cleanliness are poor.	EMIS data fitness for analysis: relevance, accuracy, completeness, recency and cleanliness have significant issues.	EMIS data fitness for analysis: relevance, accuracy, completeness, recency and cleanliness have some issues.	EMIS data fitness for analysis: relevance, accuracy, completeness, recency and cleanliness are good.	Establish a common database and assign unique identifiers that are permanent. Especially for students without documentation, common standards of unique identifiers to be developed.

SN	Research question	Latent	Emerging	Established	Advanced	Comment
1.07	What quality assurance processes are in place and how effective are they?	Few or no quality control processes, such as validation, triangulation, and verification.	Some quality control processes, such as validation, triangulation, and verification but applied inconsistently.	Good quality control processes are implemented, such as validation, triangulation, and verification applied consistently and transparently.	Good quality control processes are implemented, such as validation, triangulation, and verification applied consistently and transparently.	Manual verification is still being conducted on selected applications by divisions that use the data. External verification of data with other ministries and agencies.
1.08	How does the EMIS protect data privacy of students and teachers?	There are no policies or legislation concerning privacy and privacy is not enforced for data on individuals.	There are policies or legislation concerning privacy but they are not enforced for data on individuals.	There are policies or legislation concerning privacy which are usually enforced for data on individuals; however, this hampers necessary data analysis and publication.	There are policies or legislation concerning privacy which are enforced for data on individuals and this does not affect required analysis and publication.	Strengthening the security for access by parents to the data of students.
1.09	How does the EMIS interact, if at all, with other administrative data systems (e.g. health, social welfare, civil registry, labour)?	The EMIS stands alone and does not derive any information from any other systems.	The EMIS' interoperability with other data systems is limited. There are no standards which govern information on entities such as individuals.	The EMIS has some interoperability with other systems based on common data standards for entities such as individuals.	Interoperability between the EMIS and other government data systems is extensive and based on common data standards.	Triangulation and data-sharing agreements to further strengthen the data and widen the scope of administrative data.
1.10	How is the EMIS managed and where is it situated in the data architecture or statistical systems of the country?	Centralised and isolated in an EMIS department or equivalent.	Centrally hosted and some access granted to national stakeholders but limited access outside the central Ministry of Education.	Access and data management at the provincial and district levels.	Fully decentralised for data entry and management at the school level.	Architecture and access points to EMIS data and reporting. Data entry point at school level. National ICT architecture and plan.



SN	Research question	Latent	Emerging	Established	Advanced	Comment
1.11	Are there sufficient resources (human and financial) available for the EMIS?	The EMIS is allocated few resources, which affects the quality of data, reporting, dissemination, and development.	The EMIS is operational but lacks funds for development or some aspects of operation, which impacts on its operation.	The EMIS is well resourced but there are some areas which could have improved resources development or some aspects of operation.	The EMIS is well resourced, with adequate funds for operation and further development to address any issues.	Budget for the EMIS only covers operational and development is still under consideration.
1.12	Is there an annual budget allocation to improve the EMIS?	There is no budget allocation for the improvement of the EMIS.	There is a budget allocated but it is insufficient to ensure the required development and or is applied inconsistently.	Budget is allocated and ensures most improvements required for the EMIS are undertaken.	Budget is allocated consistently through a systematic process of analysis of requirements and costing on an annual basis.	Budget to improve the EMIS is channelled to include operational expenditure of divisions and departments that own specific systems.
1.13	Do parents and teachers have access to EMIS data and do these data result in improved pedagogical outcomes?	Parents and teachers have no access to EMIS data and there is little evidence that EMIS data contribute to pedagogical outcomes.	Parents and teachers have access to EMIS data through the school to a limited extent, such as through raw examination results for key exam points.	Parents and teachers have good access to EMIS data through electronic report cards or school report cards or other means. They are aware of how to access and interpret this information.	Parents and teachers have extensive access to EMIS data and are able to feed back comments. The EMIS facilitates communication between teachers and parents and students.	Parents only have access to examination results of their child. Teachers only have access to their personal information and selected information of their students. Lack of consolidated and analysed data at school level.
1.14	What were the key drivers, processes, challenges, and costs of the transition from aggregate data systems to individual child systems?	There were significant barriers to transition. Funding may have been difficult, and / or budget was significantly exceeded. Many issues were encountered during the transition.	There were some barriers to transition. There may have been some challenges, in terms of technical compatibility and coordination, to be overcome during transition.	There were few barriers to transition. Transition was planned and budgeted. However, there were still some challenges encountered during transition.	Transition was carefully planned, budgeted, and capacity developed appropriately. Very few issues were encountered and these were managed with contingency planning or rapid action.	The barriers to transition have almost been fully overcome.

SN	Research question	Latent	Emerging	Established	Advanced	Comment
2.0	Strategic area: data analysis and utilisation					
2.01	To what extent are the EMIS data accessible to intended ministries and public?	EMIS data are inaccessible to external stakeholders and only published in aggregate regional or national figures.	The public and other stakeholders have access to EMIS data at regional and national level but not at individual institution level.	The public and other stakeholders have access to EMIS data at regional, national, and individual institution level in most sectors.	The public and other stakeholders have access to EMIS data at regional, national, and individual institution level in all sectors and in formats, which helps inform the progress of individual institutions.	Dashboard for national, state, district, and school-community levels. School report cards for the public.
2.02	How are the EMIS data interpreted, analysed, presented, and consumed for decision-making and policy implementation?	EMIS data are only published in raw or aggregate format. They are not analysed. Their use in policy implementation is limited.	EMIS data are analysed and presented as indicators and figures but are not used extensively at all levels of government.	EMIS data are analysed and narrated and used extensively in policy implementation at all levels of government.	EMIS data are analysed in innovative ways to the school level. They are narrated in publications and used extensively in policy implementation at all levels of government to institution level.	Use in decision-making and policymaking at national level. Usage at school level to be enhanced.
2.03	How are the EMIS data used to improve/influence the implementation of sub-national education plans at district and school levels?	EMIS data are not used for sub-national planning or in schools.	EMIS data are used for some sub-national planning but not in schools.	EMIS data are used for sub-national planning and in schools.	EMIS data are used for extensively in sub-national planning and in schools, including school development planning and access by the School Committee or equivalent.	Usage of EMIS data in school development planning.
2.04	How does the EMIS facilitate daily transactions for operational requirements?	The EMIS is not used for daily transactions and operational requirements. It simply reports statistics.	There are some operational systems, such as a human resources information system, but they stand separately from the main statistical reporting database.	There are some operational systems, such as a human resources information system, and they are integrated with the EMIS and used often.	The EMIS ecosystem of systems is well integrated and contains little data redundancy, and operational systems are used extensively.	

SN	Research question	Latent	Emerging	Established	Advanced	Comment
2.05	How does the EMIS operate with various systems and functions, e.g. student tracking (students' movement, transition, transfer etc.), real-time monitoring (attendance, academic progress etc.), early warning (dropout prevention, learning improvement etc.), and automated reporting with data visualisation, feedback loops (e.g. school report cards)?	The EMIS does not operate with system functions, e.g. student tracking (students' movement, transition, transfer etc.), real-time monitoring (attendance, academic progress etc.), early warning (dropout prevention, learning improvement etc.), and automated reporting with data visualisation, feedback loops (e.g. school report cards).	The EMIS has limited operation with system functions, e.g. student tracking (students' movement, transition, transfer etc.), real-time monitoring (attendance, academic progress etc.), early warning (dropout prevention, learning improvement etc.), and automated reporting with data visualisation, feedback loops (e.g. school report cards).	The EMIS has good operation with system functions, e.g. student tracking (students' transfer, discipline and counselling), real-time monitoring (attendance, academic progress), early warning (risk levels of dropout), and automated reporting with data visualisation and feedback loops via Education Data Repository.	The EMIS has extensive operation with system functions, e.g. student tracking (students' movement, transition, transfer etc.), real-time monitoring (attendance, academic progress etc.), early warning (dropout prevention, learning improvement etc.), and automated reporting with data visualisation, feedback loops (e.g. school report cards).	Widen access to the analysed data to include school-community level and also parents.
2.06	How is the EMIS used, if at all, to help ensure equitable distribution and allocation of resources (e.g. school grants, teachers)?	The EMIS is not used to help ensure equitable distribution and allocation of resources (e.g. school grants, teachers etc.).	The EMIS is sometimes used to help ensure equitable distribution and allocation of resources (grants to underprivileged students) through non-routine analysis.	The EMIS is often used to help ensure equitable distribution and allocation of resources (e.g. school grants, teachers etc.) through non-routine analysis and routine use.	The EMIS is used extensively to help ensure equitable distribution and allocation of resources (e.g. school grants, teachers etc.) through non-routine analysis and routine use.	Use for grant distribution for underprivileged students. Can be widened for use for school grants.
2.07	What are some key requirements and issues to consider in order to ensure better collection, analysis, and utilisation of the EMIS data?	Extensive requirements to consider to improve the EMIS.	Some requirements to consider to improve the EMIS, particularly at school level.	A few requirements to consider to improve the EMIS but the EMIS is used at all levels.	The EMIS is optimally deployed. Data are presented in an appropriate format and used routinely at all levels.	Reduce systems and applications. Enhance in-service training for teachers and administrators at school levels.

## Annex E

# Initiatives of the ICT Transformation Plan 2019–2023

The application-related initiatives are as follows, where (A) are initiatives for improvement and (B) are new innovative initiatives:

- (A1) Define data model of Ministry of Education and increase usage of data dictionary to standardise implementation of applications (Application).
- (A9) Create centralised ICT helpdesk and coordinate service level agreement management for the Ministry of Education (Operational Model and Application).
- (B1) Create a centralised core application system for management of students, teachers, and schools (Application).
- (B2) Create an integrated platform to manage the integrated system (Application).
- (B3) Develop a Ministry of Education portal as the single access point for internal and external users of information and services of the ministry (Application).
- (B4) Create a Ministry of Education Data Warehouse to support efficient decision-making in the ministry (Application).
- (B5) Create an integrated Examination Management System for schools and post-secondary institutions (Application).
- (B6) Strengthen cooperation with applications of federal governmental agencies to support the operation of the Ministry of Education (Application).
- (B7) Develop an integrated system to manage the awarding of scholarships and financial assistance in the ministry (Application).
- (B8) Develop a Knowledge Collaboration Hub and upgrade the Training Management System to ensure continuous human capital development in the Ministry of Education (Application).
- (B9) Develop a scalable data analytic platform for the Ministry of Education to become a data-driven ministry (Application).
- (B10) Implement an Asset Management System as the single system to manage all assets in the Ministry of Education (Application).
- (B11) Create a Customer Relations Management System to enhance communication with external parties (Application).
- (B12) Create a centralised Attendance Tracking System based on digital technology, for usage by all offices and educational institutions (Application).
- (B14) Use Robotic Process Automation to assist repeated regulation-based processes (Application).
- (B15) Create a centralised system to support the management of higher education institutions (Application).
- (B16) Implement a Research Management System to support research management activities, indexing, monitoring of research, and profiling of researchers (Application).

In addition, the following are initiatives relating to infrastructure and the operational model:

- (A2) Overcome network connection constraints in all educational institutions strategically and improve the local area network of Ministry of Education and its agencies (Infrastructure).
- (A3) Improve the capability and infrastructure security of the Data Centre to enable integrity and a higher level of preparedness according to the government's Public Sector Data Centre (Infrastructure).
- (A4) Create strategies and guidelines for the rental of ICT equipment (Infrastructure).
- (A5) Development enterprise architecture practice according to the public sector enterprise architecture framework to support coordination between business and ICT (Operational Model).
- (A6) Strengthen the implementation of ICT initiatives by creating a Delivery Management Office in the Ministry of Education (Operational Model).
- (A7) Empower the new ICT organisational structure and revamp the ICT Operational Model to support decision-making and drive operations (Operational Model).
- (A8) Strengthen ICT policy and procedures to meet the operational needs of ICT across all levels in the Ministry of Education (Operational Model).
- (A10) Enhance ICT competencies and capabilities to strengthen ICT practices (Operational Model).
- (A11) Improve infrastructure and connection to the Malaysian Research and Education Network (Infrastructure).
- (B13) Enable a cloud-based application platform to ease the development of e-learning for students and teachers (Infrastructure).





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