GUIDELINES TO DEVELOP EDUCATION MANAGEMENT INFORMATION SYSTEM (EMIS) FOR EDUCATION DEPARTMENT

HIGHLIGHTING DESIGN, IMPLEMENTATION AND QUALITY ASSURANCE PROCESSES
GUIDELINES TO DEVELOP EDUCATION MANAGEMENT INFORMATION SYSTEM (EMIS) FOR STATE SCHOOL EDUCATION DEPARTMENT

HIGHLIGHTING DESIGN, IMPLEMENTATION AND QUALITY ASSURANCE PROCESSES

DECEMBER 2015
Report Distribution and Revision Sheet

Project Name: RMSA Technical Cooperation Agency
Report Number: RMSATCA 4.9
Report Title: Guidelines to develop Education Management Information System for School Education, Highlighting design, implementation and QA processes

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Originator</th>
<th>Checker</th>
<th>Approver</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>December 2015</td>
<td>Jim Shoobridge</td>
<td>Saurabh Dwivedy</td>
<td>Jayshree Oza</td>
</tr>
</tbody>
</table>

Note on Documentary Series

A series of documents has been produced by RMSA Technical Cooperation Agency for the Government of India’s programme to make good quality secondary education available, accessible and affordable to all young persons in the age group of 14-18 years.

The documentary series is arranged as follows:

RMSATCA 0    Programme Management Reports and Documents
RMSATCA 1    National Achievement Survey (Reports and Documents for Thematic Area 1)
RMSATCA 2    Teacher Management and Development (Reports and Documents for Thematic Area)
RMSATCA 3    School Standards, Evaluation and Development (Reports and Documents for Thematic Area 3)
RMSATCA 4    Data Management and Use (Reports and Documents for Thematic Area 4)
RMSATCA 5    Results Focused Planning (Reports and Documents for Thematic Area 5)
RMSATCA 6    Research (Reports and Documents for Thematic Area 6)
RMSATCA 7    Communication and Knowledge Management (Reports and Documents for Thematic Area 7)

Disclaimer

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.
Acknowledgements

The RMSA - Technical Cooperation Agency team would like to express their gratitude for the states reviewed as part of the study which helped to inform this report. Special note should be made of Madhya Pradesh, Karnataka for their time and hospitality. Special thanks are due to teams and individuals in both states including the Additional Chief Secretary, the RMSA SPD and Deputy Secretary for the time spent with the team despite their busy schedules. The team would also like to thank all the secondary education Directors, the Deputy Director SCERT, the IASE staff, government officials, school principals and teachers who were consulted and who helped inform these guidelines, for describing and sharing their insights on various aspects of Education Management.
## List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPO</td>
<td>Business Process Overview</td>
</tr>
<tr>
<td>CAC</td>
<td>Central Admissions Cell</td>
</tr>
<tr>
<td>DCF</td>
<td>Data Collection Format</td>
</tr>
<tr>
<td>DDO</td>
<td>Drawing and Disbursement Officer</td>
</tr>
<tr>
<td>DEO</td>
<td>District Education Officer</td>
</tr>
<tr>
<td>DFID</td>
<td>Department for International Development (UK)</td>
</tr>
<tr>
<td>DISE</td>
<td>District Information System for Education</td>
</tr>
<tr>
<td>DMU</td>
<td>Data management and Use</td>
</tr>
<tr>
<td>EMIS</td>
<td>Education Information System</td>
</tr>
<tr>
<td>HRM</td>
<td>Education management</td>
</tr>
<tr>
<td>HR</td>
<td>Human Resources</td>
</tr>
<tr>
<td>ID</td>
<td>Identification</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
</tr>
<tr>
<td>MP</td>
<td>Madhya Pradesh</td>
</tr>
<tr>
<td>NCERT</td>
<td>National Council for Educational Research and Training</td>
</tr>
<tr>
<td>NIC</td>
<td>National Informatics Centre</td>
</tr>
<tr>
<td>NUEPA</td>
<td>National University for Education Planning and Administration</td>
</tr>
<tr>
<td>OOSC</td>
<td>Out of School Children</td>
</tr>
<tr>
<td>P&amp;B</td>
<td>Planning and budgeting</td>
</tr>
<tr>
<td>RMSA</td>
<td>Rashtriya Madhyamik Shiksha Abhiyan</td>
</tr>
<tr>
<td>RMSA TCA</td>
<td>Rashtriya Madhyamik Shiksha Abhiyan Technical Cooperation Agency</td>
</tr>
<tr>
<td>SEMIS</td>
<td>Secondary Education Management Information System</td>
</tr>
<tr>
<td>SLG</td>
<td>Stakeholder Leadership Group</td>
</tr>
<tr>
<td>TCF</td>
<td>Technical Cooperation Fund</td>
</tr>
<tr>
<td>TTPS</td>
<td>Teacher Transfer Personnel System</td>
</tr>
<tr>
<td>TTS</td>
<td>Teacher Training System</td>
</tr>
<tr>
<td>U-DISE</td>
<td>Unified-District Information System for Education</td>
</tr>
</tbody>
</table>
# Table of Contents

**ACKNOWLEDGEMENTS** .................................................................................................................................................. III

**LIST OF ACRONYMS** ................................................................................................................................................ IV

**LIST OF TABLES** ....................................................................................................................................................... VII

**LIST OF FIGURES** ..................................................................................................................................................... VIII

**EXECUTIVE SUMMARY** ........................................................................................................................................... IX

1. **INTRODUCTION TO EMIS AND THIS GUIDEBOOK** ........................................................................................ 10

   1.1 **Overview of This Guidebook** .......................................................................................................................... 10

   1.2 **The Importance of Information Systems in Education Management** ................................................................. 12

   1.3 **What is an Education Management Information System (EMIS)** ................................................................... 12

   1.4 **EMIS, Global, Regional and India Status** ........................................................................................................ 13

   1.5 **Why Use EMIS in India?** .................................................................................................................................... 14

   1.6 **The Problem Situation and Purpose of These Guidelines** ............................................................................. 16

2. **WHAT DEFINES A GOOD EMIS?** ...................................................................................................................... 18

   2.1 **Overview** ......................................................................................................................................................... 18

   2.2 **Why Data and Information for Education** ....................................................................................................... 18

   2.3 **Trends in Education Management that Influence EMIS and EMIS Data** ....................................................... 20

   2.4 **What Are the Characteristics of a Good EMIS?** .............................................................................................. 23

3. **THE ARCHITECTURE OF A GOOD EMIS AND ITS COMPONENTS** ............................................................... 27

   3.1 **Overview** ......................................................................................................................................................... 27

   3.2 **High Level Architecture of a Good EMIS** .......................................................................................................... 27

   3.3 **EMIS Sub-Systems** ............................................................................................................................................. 28

   3.4 **EMIS Data Warehouse** ....................................................................................................................................... 35

   3.5 **EMIS and U-DISE** .............................................................................................................................................. 36

   3.6 **Tools to Use with EMIS** ..................................................................................................................................... 39

   3.7 **Links to Other Systems** .................................................................................................................................... 42

   3.8 **Using Population Data and Triangulation of Data** ............................................................................................ 43

   3.9 **Ensuring All Sub-Sectors Using EMIS** ............................................................................................................. 43

   3.10 **Difficult to Capture EMIS Data** .................................................................................................................... 46

4. **EMIS IMPLEMENTATION PROCESS** ................................................................................................................ 47

   4.1 **Overview of the EMIS Strengthening and Development Process** .................................................................. 47

   4.2 **Implementing the EMIS Process** ..................................................................................................................... 47

5. **STEP 1: ESTABLISHING THE ORGANISATIONAL AND POLICY FRAMEWORK TO SUPPORT IMPLEMENTATION OF EMIS** 50

   5.1 **Developing a Data Sharing Policy or Agreement** ........................................................................................... 50

   5.2 **Establishing or Strengthening EMIS Leadership** ............................................................................................ 51

   5.3 **Establishing or Strengthening an EMIS Unit and Its Role in Development** .................................................. 55

   5.4 **Preparing the Unit or Department Responsible for Ensuring Technical Quality and Hosting** ........................ 55

6. **STEP 2: DEFINE KEY POLICY QUESTIONS, ISSUES AND FUNCTION AND DEVELOP THE SOFTWARE REQUIREMENTS** 57

   6.1 **Overview of an EMIS Requirements Document** ............................................................................................ 57

   6.2 **Developing Education Policy and Management Questions and Indicators** ..................................................... 57

   6.3 **Ensuring Education Policies and Plans Can Be Facilitated and Monitored through the EMIS** .......................... 59

   6.4 **EMIS Data** ......................................................................................................................................................... 59
7. **STEP 3: ASSESSING AND IMPROVING EXISTING SYSTEMS AND DEVELOPING THE IMPLEMENTATION PLAN** .......62

7.1 **WHAT IS AN IMPLEMENTATION PLAN** .............................................................................................. 62
7.2 **ASSESS THE PRESENT SYSTEMS USED FOR EDUCATION MANAGEMENT** ........................................... 63
7.3 **PLANNING FOR DEPLOYMENT OF THE EMIS** ...................................................................................... 63
7.4 **REVISING DATA COLLECTION AND REPORTING** .............................................................................. 67
7.5 **DETERMINING A SOFTWARE SOLUTION** ............................................................................................ 70
7.6 **MIGRATING DATA TO THE NEW EMIS FROM LEGACY SYSTEMS** ..................................................... 76
7.7 **BASELINE DATA CAPTURE** .............................................................................................................. 80
7.8 **PLANNING FOR CAPACITY DEVELOPMENT OF STAFFS** .................................................................... 83
7.9 **INCLUSION OF NON-DEPARTMENT OF EDUCATION SCHOOLS IN EMIS** ......................................... 84
7.10 **DETERMINING THE IMPLEMENTATION MODALITY, SCHEDULE, CRITERIA AND BUDGET** ............... 85

8. **STEP 4: IMPLEMENTING THE EMIS** ..................................................................................................... 90

8.1 **COMMUNICATING CHANGE TO ALL STAFF** ....................................................................................... 90
8.2 **DETERMINE DATA FLOW AND OBTAIN COMPLIANCE FOR SHARING DATA** ...................................... 91
8.3 **REGULAR IMPLEMENTATION MEETINGS AND PROJECT TRACKING** .................................................. 91
8.4 **REPORTING TO THE SLG** ............................................................................................................... 91
8.5 **MAINTAIN DATA SECURITY AND BACKUP** ........................................................................................ 91
8.6 **CLOSING THE IMPLEMENTATION PHASE, POST IMPLEMENTATION REVIEW (PIR) OF THE EMIS** ....... 92

9. **STEP 5: USE DATA TO MAKE DECISIONS AND ENSURE SUSTAINABILITY** ..................................... 95

9.1 **OVERVIEW** ....................................................................................................................................... 95
9.2 **ENSURE PROPER STAFF CAPACITY AND MOTIVATION** .................................................................... 95
9.3 **ENSURE ONGOING SUPPORT TO THE EMIS** ..................................................................................... 96
9.4 **MAINTAINING THE QUALITY AND COMPLETENESS OF EMIS DATA** ............................................... 97
9.5 **ENSURE THE USE OF DATA DERIVED FROM THE EMIS IN EFFECTIVE DECISION MAKING** ............. 98
9.6 **KEEP THE EMIS RELEVANT AND ENSURING SUSTAINABILITY** ..................................................... 98

10. **EXAMPLE OF STATE EMIS MADHYA PRADESH EDUCATION PORTAL** ........................................... 99

10.1 **EDUCATION SECTOR** ....................................................................................................................... 99
10.2 **ABOUT THE EDUCATION PORTAL** .................................................................................................. 100
10.3 **STAKEHOLDERS AND BENEFICIARIES** .......................................................................................... 100
10.4 **MAJOR CHALLENGES BEFORE IMPLEMENTING THE EDUCATION PORTAL** .................................. 101
10.5 **OBJECTIVES OF THE EDUCATION PORTAL** .................................................................................... 101
10.6 **FEATURES OF THE PORTAL** .......................................................................................................... 102
10.7 **LEGISLATIVE AND POLICY ENVIRONMENT** ..................................................................................... 103
10.8 **CHILD AND FAMILY TRACKING SYSTEM – SAMAGRA SAMAJI SURAKSHA MISSION (SSSM)** .......... 103
10.9 **SUBSYSTEMS (MODULES) OF THE EDUCATION PORTAL** ................................................................. 104
10.10 **IMPLEMENTATION STRATEGY CONTRIBUTING TO SUCCESS** ......................................................... 106
10.11 **CHALLENGES ENCOUNTERED DURING IMPLEMENTATION** ............................................................. 107
10.12 **TECHNOLOGY EMPLOYED** ............................................................................................................. 108
10.13 **EDUCATION PORTAL AND ITS LINKS WITH UDISE** ...................................................................... 108
10.14 **THE BENEFITS OF THE EDUCATION PORTAL** ................................................................................. 110
10.15 **FINANCIAL MODEL** ....................................................................................................................... 113
10.16 **POTENTIAL FOR REPLICATION IN OTHER STATES OF INDIA** ...................................................... 114
10.17 **ISSUES FOR FUTURE CONSIDERATION** ........................................................................................... 114
10.18 **REFERENCE** .................................................................................................................................... 115

11. **GUIDING PRINCIPLES AND LESSONS LEARNED FROM STATE IMPLEMENTATION OF EMIS** .......... 116
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIGURE 1</td>
<td>USE OF EMIS DATA BY LEVEL OF DECISION-MAKING</td>
<td>19</td>
</tr>
<tr>
<td>FIGURE 2</td>
<td>HIGH LEVEL ARCHITECTURE OF A GOOD EMIS</td>
<td>27</td>
</tr>
<tr>
<td>FIGURE 3</td>
<td>HIGH LEVEL ARCHITECTURE OF A GOOD EMIS</td>
<td>38</td>
</tr>
<tr>
<td>FIGURE 4</td>
<td>SIMPLIFIED CHART OF THE FLOW OF INFORMATION IN A DEMOGRAPHIC FINANCIAL SIMULATOR</td>
<td>40</td>
</tr>
<tr>
<td>FIGURE 5</td>
<td>STEPS TO DEVELOPING EMIS</td>
<td>48</td>
</tr>
<tr>
<td>FIGURE 6</td>
<td>FOUR STAGES OF REVIEWING DATA COLLECTION AND REPORTING</td>
<td>68</td>
</tr>
<tr>
<td>FIGURE 7</td>
<td>SIMPLIFYING U-DISE IN MADHYA PRADESH</td>
<td>109</td>
</tr>
<tr>
<td>FIGURE 8</td>
<td>KEY POLICY AREAS FOR EMIS</td>
<td>121</td>
</tr>
<tr>
<td>FIGURE 9</td>
<td>MEASURING EMIS KEY POLICY AREAS</td>
<td>122</td>
</tr>
</tbody>
</table>
Executive summary

This document establishes guidelines for development of Education Management Information Systems (EMIS) for state Departments of Education. The guidelines have been developed after extensive consultation in five focal states of the Rashtriya Madhyamik Shiksha Abhiyan Technical Cooperation Agency (RMSA TCA) programme of support.

The guidelines are intended as a resource to help State Departments of Education in the development of information systems to help manage state education systems. The document provides information specific to an EMIS for education departments and outlines a full strategic approach towards development. The guidelines provide information on what makes a quality EMIS and which factors should be factored when considering development of State EMIS. Quality assurance is mainstreamed throughout the document and quality assurance processes are also specified in a separate section.

The guidelines also provide reference to resources which can assist state departments of education to develop their EMIS and also outlines an example of successful state EMIS in Madhya Pradesh, India. The guidelines are not intended to be a comprehensive design document for implementation of EMIS. They are intended to inform the reader as to what is important to consider when implementing an EMIS, including factors influencing the quality of the systems and data. The guidelines advocate a five step approach to development and sustainability of EMIS. These are:

- Step 1: Strengthen legal and organisational environment.
- Step 2: Define Key Policy Questions, Issues and Functions.
- Step 3: Assessing and Improving Existing Systems and Developing the Implementation Plan.
- Step 4: Implementing the EMIS.
- Step 5: Use Data to Make Decisions and Ensure Sustainability.

It is hoped that these guidelines provide a valuable additional resource for the development of state education EMIS and that they can help encourage use of best practice in the continued development of State EMIS. This should ultimately lead to a better managed education system and improved deployment of valuable and limited resources which should benefit children in schools throughout India.
1. Introduction to EMIS and this Guidebook

Goal: Understand why an EMIS is important to the functioning of Departments of Education and what it can do to help improve education.

1.1 Overview of this Guidebook

1.1.1 Purpose of these Guidelines

The purpose of this document is to guide State Ministries and Departments of Education in the development of Education Information systems to help better manage, plan, evaluate and monitor the education system. The document outlines a strategic approach, involving data requirements, system requirements, personnel training and institutionalisation of process requirements which can help develop an Education Management Information System (EMIS) at the state level. Quality assurance is mainstreamed throughout the document and quality assurance processes are also specified in a separate section.

1.1.2 Who is this Guidebook Intended for?

This guidebook is principally developed for those education organisations, particularly state Department of Education, who are considering implementation of a new Education Management Information system or improve an existing system. For those who are considering development of EMIS, it is recommended that you read through the entire guide and develop a plan for implementing the EMIS strengthening procedures before you start system development.

1.1.3 Who Should Read this Guidebook?

This guidebook is long and complex and we appreciate that most managers will not have the time to be able to read and understand all elements of the guidebook. The following table details which sections are relevant to which people within the Ministry or Department of Education as well as external stakeholders who may want to understand the process of development of the EMIS.

Table 1. Guidebook sections and their relevance to different stakeholders

<table>
<thead>
<tr>
<th>ID</th>
<th>Position of staff</th>
<th>Relevant Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ministers</td>
<td>Executive Summary VI</td>
</tr>
<tr>
<td></td>
<td>Permanent Secretary</td>
<td>Section 1: Introduction to EMIS and this Guidebook</td>
</tr>
<tr>
<td></td>
<td>Heads of Divisions / Departments</td>
<td>Section 2: What Defines a Good EMIS?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 3: The Architecture of a Good EMIS and its Components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 5: Step 1: Establishing the Organisational and Policy Framework to Support Implementation of EMIS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 10: Example of State EMIS Madhya Pradesh Education Portal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Section 11: Guiding Principles and Lessons Learned from State Implementation of EMIS</td>
</tr>
<tr>
<td>2</td>
<td>EMIS Manager and EMIS project lead</td>
<td>All</td>
</tr>
</tbody>
</table>

---

1 This section and several others in this guide draw on information contained in the education EMIS toolkit http://www.iEMIS.org/
It is strongly advised in this document to communicate the development of EMIS to all relevant stakeholders through easy to understand promotion material. The material should be no more than 2-3 pages and should explain clearly why the EMIS is being developed and its benefits.

1.1.4 Other Documents in this Series

This document compliments the document “Guidelines to Development of Human Resource Information Systems for School Education Highlighting design, implementation and QA processes.” The two documents can be used together as a comprehensive resource for development of State Education Management Information Systems (MIS) throughout India.

1.1.5 Development of the Guidelines

These guidelines were developed through a process of consultation and review in five focal RMSA TCA states throughout India. These were: Madhya Pradesh, Karnataka, Bihar, Orissa and Assam. The guidelines were further refined through the extensive literature review presented in this document as well as the international consultants’ experience in the implementation of Education Information Systems in Ministries of Education in over twenty countries globally.

1.1.6 Scope and Limitations of these Guidelines

This guideline has been developed to assist states as a resource towards development of EMIS to support Department (or Ministries) of Education. They are not intended to be a comprehensive design document for implementation of EMIS. They are intended to inform the reader as to what is important to consider when implementing an Education Management Information System including factors influencing the quality of the systems and data.

1.1.7 Disciplines required to implement an EMIS

Implementing an EMIS requires a diverse array of disciplines. The full extent to which skills are required will depend on decisions made during the analysis and planning phase. These guidelines are developed in order to help ensure that you are given the best and most up to date advice in how to implement and deploy an EMIS. If certain technical functions such as development and hosting of the systems can be outsourced to a service provider, then it is likely that existing staffs can easily be trained to use the new system without requiring specific technical skills. For departments of education
willing to outsource these functions, retraining of existing staffs will likely be sufficient to enable
implementation of EMIS. These guidelines are developed to help ensure a successful implementation
and minimum overheads for maintaining the system once implemented.

1.2 The Importance of Information Systems in Education Management

Ministries of Education must treat information as any other resource or asset. It must be organized,
managed and disseminated effectively for the information to exhibit quality. Within a ministry,
information flows in four basic directions as upward, downward, horizontal and outward/inward
(Haag & Cummings, 2008). Taking into account that there is a huge amount of information flow in
organizations, it will be possible to understand the importance of information systems in
organizations.

The information systems field is arguably one of the fastest changing and dynamic of all the business
processes because information technologies are among the most important tools for achieving
system’s key objectives. Throughout India, during the past 30 years, more and more information
relating to education management and the flow of information among key actors in the education
sector has been computerized. Ministries of Education invest in information systems as a way to cope
with and manage their internal management functions and to cope with the demands of stakeholders
to see improved child learning outcomes (SDG 2015).

Management information system (MIS) is designed to assist managerial and professional workers by
processing and disseminating vast amounts of information to managers’ organization-wide (Alavi &
Leidner, 1999). A Management information system is any system that provides information for
management activities carried out within an organization. The information is selected and presented
in a form suitable for managerial decision making and for the planning and monitoring of the
organization’s activities. Management information systems can be used to support education
managers to make strategic, tactical and operational decision.

1.3 What is an Education Management Information System (EMIS)

Education Management Information System (EMIS) refers to the systems and processes used to
collect, process and manage information about the Education system. A comprehensive EMIS is
defined as not only including administrative and pupil data, but also financial, human resources, and
learning data (Abdul-Hamid 2014). Therefore, an EMIS refers to the collection of systems that collect,
analyses and report on data concerning education staff, pupil, infrastructure, assessment and financial
data as well as any other data concerning education which may be useful in Education planning. The
data available through EMIS will typically be used by the Ministry of Education, Other Ministries,
NGOs, researchers, donors and other education stakeholders for research; policy and planning;
monitoring and evaluation; and decision making. Uses of EMIS information include, but are not limited
to, informing monitoring and planning of the education sector through indicators that monitor the
performance of an education system and to manage the distribution and allocation of educational
resources and services.

Expectations concerning the capability of EMIS have undergone significant changes in the past decade
in line with progress in technology and in response to increased monitoring expectations of
governments and development partners, particularly the need to monitor performance and
achievement (UNESCO 2015). EMIS in its most basic sense is a school census conducted annually and
used to collect information on pupils, teachers, facilities, finances and other issues relating to
institutions such as schools and higher education facilities. However during the past decade EMIS has
increasingly incorporated resource management systems such as Human Resource Information Systems (HRIS) and performance evaluation systems such as student tracking and examination systems.

It has also been increasingly desirable for EMIS to be decentralized so that the producers of the data, typically actors at the school and lower administrative levels, can be direct beneficiaries of the products of the systems. EMIS systems should be integrated. For example, data from the Human Resources Information System should be able to be easily integrated with data from student performance systems and information concerning provision of resources to schools. Finally, EMIS systems should be cost effective and easy to operate and this now usually entails making use of the internet as a method of deployment. Using the internet centralizes required technical expertise, allows for rapid changes and fixes to be applied and facilitates remote access and capacity development such as training. Whilst it is unrealistic to expect institutions throughout a country such as India to access EMIS via the internet, provision should be made for the future as institutions and administrative offices will gain access to the internet rapidly as they have in other countries in recent years.

EMIS information should be available both at the individual and aggregate level. The type of data entered into the system needs to follow logic, fixed methodology, and have a well-defined purpose. Therefore, a successful EMIS typically adheres to three key principals, a) decentralised b) integrated and c) per unit coverage of individual teachers, students and financial transactions. Decentralisation of systems must follow decentralization of planning and administration of the education system (Shoobridge 2015b). Decision makers at each level of government must have relevant information available from EMIS in order to make decisions effectively.

1.4 EMIS, Global, Regional and India Status

Global investment in the development of Education Management Information Systems (EMIS) has been relatively high in recent years. In the pursuit of quality education for all, the significance of timely, cost effective and accurate data in evaluating education policy, determining education planning, and monitoring of the progress towards attainment of development goals is increasingly important. However in many cases, countries and states of India are hampered in conducting evidence-based policymaking in education because they lack reliable, relevant, and easily accessible information about schools, teachers, enrolments, and education outcomes.

The Asian Pacific region contains some of the world’s most advanced information-driven societies as well as those that are at the very early stages of development. Among the most developed countries with information policies are the People’s Republic of China, Japan, Singapore, the Republic of Korea and India. While Japan is moving towards anything-anytime-anywhere access with complete assurance driven by the u-Japan Policy Package, Singapore’s Singapore ONE and Korea’s Informatization policies have a holistic coverage. In 2006, the Chinese government mapped The State Informatization Development Strategy 2006-2020 with meticulous care to set forth China’s goals, tasks, plans and policies in information development for the next 15 years (UNESCO 2015). In order to assess the progress towards policy goals, an effective EMIS is required.

---

2 Over forty World Bank education projects over the last four years have had components related to the development of education management information systems (EMIS), but little is known about best practices and lessons learned from such investments (http://www.camemis.com.kh/university-references/36-education-management-information-systems-emis).
Throughout the Asia Pacific Region, there are examples of effective and functional EMIS. The Republic of Korea and Singapore have reliable education information systems. India has some states with excellent information systems and India also operates a national census system called U-DISE which collects detailed information on the entire country for the purpose of resource allocation for lower secondary education Rashtriya Madhyamik Siksha Abhiyan (RMSA)³. Fiji and Vanuatu both have highly detailed and decentralized information systems. Cambodia and Malaysia both have functional EMIS however the reliability of data varies. However in many cases, countries are hampered in conducting evidence-based policymaking in education because they lack reliable, relevant, and easily accessible information about schools, teachers, enrolments, and education outcomes.

Regionally some countries are starting to support School Information Systems which provide real time and accurate data to centralized systems via the internet. EMIS in Fiji (FEMIS) provides an excellent example of an integrated system that captures data on individual teachers and students (Shoobridge 2014). Student data is entered at the school level, which contains information such as: student identification number, registered birth number, parent details, gender, ethnicity, date of birth, home situation (e.g., household income, electricity,), school attendance, record of school fees, and financial assistance. In addition, it captures health records of each student, including special needs data. FEMIS is also linked to the national teacher data system (FESA) and assessment data system (FANA). These links help answer a range of questions such as: which children with disabilities, in which settings, under what circumstances, are achieving what educational outcomes? Or, which teachers with what qualifications are creating environments that result in good learning outcomes?

1.5 Why use EMIS in India?

An education information management system provides knowledge to education stakeholders about the status of the education system as a whole and the learning outcomes within a country. By using an EMIS, governments are able to analyse and utilize data to improve their education systems. The quality of education, a high-stakes education issue, has increasingly become the focus of education policy.

Although EMISs have played an important role in the global effort to achieve universal education coverage, available evidence from test scores clearly shows that universal coverage is insufficient to produce an educated population. Efforts should accordingly shift to producing education of better quality (Mourshed, Chijioke, and Barber 2010). An EMIS helps generate the following value-added components to improve educational quality:

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

³ “Rashtriya Madhyamik Shiksha Abhiyan (RMSA), is a comprehensive and integrated programme of the Government of India (GOI) for providing quality and meaningful education to all children in the age group 14-16 years of age for Secondary Schools and 16-18 years of age for Higher Secondary Schools in Assam. RMSA has a vision to make secondary education available, accessible and affordable to all young persons.” (http://www.rmsaassam.in/)
However, reliable, relevant, and easily accessible information about specific schools, teachers, enrolments, and educational outcomes is still lacking in many countries. Additionally, few countries have implemented quality assurance measures to check the quality, accuracy, validity, reliability, and usability of the data collected by their respective EMISs.

- **Efficient expenditure:** Information systems enable countries to be cost-efficient and effective in their education planning.

- **Institutionalized data systems:** When institutionalized and guided by a clear vision and strategic planning, an EMIS helps policy makers manage an education system to produce quality outputs.

- **Unfortunately, many countries have invested resources in building education management information systems, but these systems are often not institutionalized, lack a guiding vision, and are not incorporated into strategic planning processes.**

- **Data-driven policies:** Education management information systems are intended to help government experts design and implement policies. Unfortunately, most countries have not formulated policies on how to use EMIS data in planning and decision making. Even in countries where information systems are institutionalized, they are barely used to guide education policies (UNESCO 2003).

- **Smart investments:** One of the recommendations made by the World Bank’s Education 2020 Strategy is to invest smartly. One value-added dimension of an EMIS is that it empowers a decision maker to make smart spending decisions, based on data and analytics of investments proven to contribute to learning (World Bank 2011).

The education and training sector plays a vital role in India’s development. State Departments of Education throughout India are placing an increasing emphasis on ensuring good governance and accountability. In the education sector, there is a strong recognition that robust data, monitoring and accountability systems can play an important role in improving resource utilization and strengthening education system performance.

The setting up or the strengthening of an information system is based on the premise that all organizations whatever they might be, have to produce information to inform on their condition (and their characteristics), their functioning and their results. Without data, no system can function rationally, and consequently no operational decision can be taken. The education system is not an exception to this rule. Indeed, the development and the growing complexity of education systems and the needs for regulation and coordination which they require, make information one of the main elements of the administration, management and planning of education, providing in this way the foundation for decision-making at every level of the system.

At the root of all information systems is the question of the purpose of the information to be collected. The education system is composed of a multitude of interacting actors at different levels who need to be informed on the status of the system, its achievements and performance, its needs and shortcomings. Although interacting with one another, these actors have different and varied information needs which the information system should take into account and respond to appropriately.

The challenge a good EMIS must meet is to harmoniously integrate different sources of data and to make information available to those requiring it in order to improve management, planning, monitoring and evaluation of the education system. The effective management of the sector requires stakeholders and actors at all levels to have access to information and data that supports:

1. Resource allocation
2. Education Policy and Planning
3. Local, national and international reporting
4. Strengthened accountability
5. Education administration innovation

As India further moves towards decentralized planning in which states, districts and blocks play lead roles in the management and oversight of education institutions, there is a strong need to ensure that robust and timely data is available at the sub-national level for preparation of State Education Strategic Plans to inform State education policies and for micro level planning of resource allocation to schools. As planning becomes increasingly decentralized there is a need for detailed education data at the Block and school levels to inform Block and school development planning.

Therefore, ideally the EMIS should ultimately support the management, planning, monitoring and management requirements of the following actors and stakeholders:

1. School managers and administrators
2. Parents and local communities
3. Department of Education - National, State, District and block
4. Department of Finance (MoF)
5. Statistical bodies
6. Development Partners such as Non-Government Organisations (NGOs) and private schools.

Further, as States of India progress towards universal basic education, there is a need to ensure that marginal and disadvantaged groups are properly targeted and have their needs addressed. There is also a strong need to focus on aspects of the quality of education and to monitor education outcomes. Both these objectives require robust and detailed information on the education system. In order to use EMIS data, education managers need to have confidence that the data is robust, accurate and relevant.

1.6 The Problem Situation and Purpose of these Guidelines

In many States of India, the collection and processing of education data is time consuming, cumbersome and unidirectional and as a result limited data is used in planning. Many states of India are unable to use empirical data to inform planning, monitoring, evaluation and management of the education system. As a result, decisions are often made based on other criteria and resources are not utilised to their best and most optimal extent.

U-DISE is the national standard for collection and reporting of education data throughout India. However, a review of U-DISE data (RMSA TCA 2015) indicated that, in general, U-DISE data lacked consistency and credibility; however, the extent to which data was erroneous varied between states, districts and blocks. Different subsets of schools, as determined by school code and number of schools, were reported in each census. Enrolments, teacher and facility data varied to greater extents than would be expected and enrolment rates were neither consistent nor comparable to other data such as data derived from national survey (NSS). Substantial data fell outside of credible thresholds for established indicators such as Pupil to Functional Classroom Ratio (PFCR). The report concludes that there is presently insufficient consistency or credibility to use the data for reporting of national education statistics. This is not to say that U-DISE cannot be useful, however the problems need to be acknowledged and the issues addressed through development of good State EMIS systems.

Studies also indicate that throughout India, producers of education data, which are the actors at the school level, rarely receive data back in any form and are not aware of how data is used to influence management of the school or allocation of resources (RMSA TCA 2014). EMIS needs to evolve to include feedback loops that carry information back to the local level. While it is a good first step to establish a strong flow of data from schools to subnational levels and finally to the national level,
including validation procedures at each stage, it is critical for an EMIS to institute feedback loops that carry information back down the chain to the local level.

Often national publication of statistics are produced but are of limited use to school officials, local authorities and communities. U-DISE has piloted a school report card comparing schools to regional and national averages and targets for selected indicators however the pilot was discontinued and report cards are generally not used nor useful to the planning process. Feedback loops increase utilization of data at the local level and improve the frequency and accuracy of source data.

It is therefore necessary for states throughout India to also consider further enhancement of their EMIS to progress towards the goal of real time, reliable education data at all levels of the system to ensure information driven decisions are made for education policy and planning. This document is intended to provide a roadmap that will enable states to develop costed development and implementation plans to achieve these goals to further develop their EMIS to meet the global standards in education management.
2. What Defines a Good EMIS?

Goal: To gain a high level understanding of the characteristics of a good EMIS and which general areas of Education Planning, Monitoring, Evaluation and Management a good EMIS should respond to.

2.1 Overview

The role of education data in planning, monitoring, evaluation and budgeting of the education system is complex and should be covered under separate guidelines. The information given in this section is intended as a brief overview to help orientate state Departments of Education towards thinking which will result in an EMIS which is responsive to the user.

2.2 Why data and information for education\(^4\)

The education system relies on accurate, timely and complete education data and information in order to function properly. Without data, an Education System cannot function rationally, nor can operational decision be made. Indeed, the growing complexity of education systems and the needs for better regulation and coordination have made data and information an indispensable element of the administration, planning and monitoring of education. Eventually, information provides the foundation for evidence-based decision-making at every level of the system (Carrizo 2004).

As mentioned above, data and information are produced to facilitate the administration of the education services, the analysis and planning of the education development at macro, intermediary and micro levels, and also the monitoring and evaluation of the education performance at the system level and in programme areas.

2.2.1 Administration of Education

The first aim of an EMIS is to help manage and administer the delivery of education services by generating routine data and information for operational purposes, such as quarterly, monthly and weekly records of the presence and movements of students and personnel, salary payment, the results of tests and examinations, financial transactions, etc. Such detailed information is particularly important for operational management of education service delivery at the local and school levels.

Education Managers use EMIS to manage services in order to monitor the effectiveness of policy and plans and to monitor progress and identify shortcomings. EMIS typically informs questions such as: Do we have enough human, physical and financial resources to operate properly and produce the expected results? Are the young people attending school? How are they learning? Do educational services provided respond to their needs? The information generated by EMIS help answer these questions, while verifying the internal and external efficiency of the education service provision. It is important to ensure that the human, physical and financial resources invested are used in an optimal way in order to achieve better quality, equity and efficiency in education.

A good EMIS will give weekly, monthly and annual reports to help inform regular management of the education system.

2.2.2 Analysis and Planning of Education

Secondly, EMIS data assists in the analysis of the relevance, efficiency and effectiveness of policies and programmes, and helps education planners and managers explore the future options and directions for educational development. The preparation of an education plan is a complex exercise,
which requires not only specific technical skills, but also the availability of reliable and relevant information. A good EMIS can feed reliable data to school mapping, resource projections and the process of planning the course of action for the medium and long term development of education.

In fact, data is often collected in education systems however their analysis and use are often limited. It is not uncommon to find that data collected are not published except in the form of bulky reports containing little analysis, long statistical tables and without sufficient narrative or qualitative analysis. Many experts deplore such “data-rich, information-poor” situations where data are extensively collected with limited use for analysis, monitoring and evidence-based decision-making. Lack of capacity and insufficient conducive environment that encourages the use of data and information at different layers of administration are the frequently cited causes for such situations.

2.2.3 Monitoring and Evaluation of Education

Rational decisions are based on analysed data made available and accessible in the form of indicators that can facilitate the monitoring and evaluation of education policies and programmes. A functioning EMIS will provide reliable and objective information that can be used to inform monitoring and evaluation of policies and programmes. This can greatly facilitate identification of successes, shortcomings and obstacles as well as the undertaking of remedial actions. A good EMIS can inform the performance, efficiency and effectiveness of education service provision. An actor in the education sector, be they teacher, school principal, administrator or manager, needs timely, analytical, relevant, synthesized and easy to understand information in order to help inform decisions.

2.2.4 Information Flow across Levels of Decision Making

To be useful, EMIS information should be adapted and made accessible to all levels of decision-making of the education system.

One can distinguish three main levels of data use, which correspond to the tasks of three levels of education administration in most education systems. The higher the level of detail and disaggregation of information to use, the lower the level of decision-making, i.e., close to the school level. The level of detail of data and information decreases as the level of decision-making goes up, where information...
becomes more aggregated and synthesized, integrating all available data so that assessment of the education system can take place over regions rather than individual schools.

The macro level administration is responsible for strategic decisions concerning the planning of the whole education system. The category of decisions at this level concerns the general policy directions. The information required are aggregates that are used for setting and monitoring the policy objectives at the national and regional levels. In India this level is the State and National Departments of Education.

The intermediate level comprises decision-makers who are in charge of management and control in the allocation and monitoring the use of resources. This level translates the general policy directions into more technical, operational decisions. It therefore requires more specific data to ensure an efficient and equitable distribution of resources, to detect possible shortcomings and to optimize the use of resources. In India this level is the District Education Office.

The micro level corresponds to operational tasks of defining the use of allocated resources to deliver education services and to translate them into concrete results. This level is concerned with more routine activities, closer to the school. The decision here has local and immediate reach and hence will require more detailed information. In India this level is the Block and School level.

Thus, these three decision-making levels, which sometimes overlap with each other at the administrative levels, require different types of reports on education data in order for education actors to be able to make judgements appropriate to their role in the education system.

2.3 Trends in Education Management that Influence EMIS and EMIS Data

2.3.1 Overview

There have notable trends in the past decade and a half that have influenced the way in which EMIS is developed and deployed and what data is captured. These include:

- From Universal Primary Education (UPE) to an ‘expanded vision’ of basic education
- Primary to Basic Education
- The impact of global initiatives and standards
- Learning Outcomes and Quality
- Planning emphasis on equity
- Monitoring intermediate Indicators of Quality
- Increasingly complex Education funding mechanisms
- Each of these terms and the impact on EMIS is explained below.

2.3.2 From Universal Primary Education (UPE) to an ‘Expanded Vision’ of Basic Education

Change: Many countries also adopted what became known as the ‘expanded vision of basic education’ which incorporated access, equity and quality learning outcomes for all children through ‘formal’ and ‘non formal’ channels, articulated ultimately in the six EFA goals (early childhood education, UPE, learning opportunities for youth, adult literacy, gender equity and improved quality). Emphasis is now being placed upon incorporating skills and vocational learning in national education sector plans.

Impact on EMIS: It is therefore important that EMIS store 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 at any age.

2.3.3 Primary to Basic Education

**Change:** The move from primary to basic education. Over the past two decades most countries restructured their education systems to include a differing number of years of ‘basic education’ to incorporate primary education and some or all the years of junior secondary education. This flexibility was helpful in recognizing that basic learning needs may vary from country to country. However, for international comparisons, countries are often also required to report progress in terms of primary education, commonly defined as the first 6 years of education.

**Impact on EMIS:** EMIS must be able to report on both progress towards universal primary education but also on progress towards universal basic education. The design of EMIS becomes more complex with range of different basic education institutions as well as senior secondary which must be accommodated and reported upon.

2.3.4 The Impact of Global Initiatives and Standards

**Change:** The drive to achieve global targets and participate in education in global initiatives such as EFA and GPE 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 standards, to provide a frame of reference for progress at the country level.

**Impact on EMIS:** EMIS should be developed to respond to local planning, budgeting, monitoring, evaluation and administrative needs however EMIS should also conform to international standards so as to enable comparison of data obtained through the EMIS with other regions and countries through globally recognized education indicators. The OEDC indicators provide a good reference for international education standards (OEDC 2015).

2.3.5 Learning Outcomes and Quality

**Change:** Recent years have seen an increased emphasis on delivering quality education to all. The past two decades have seen a growing interest in strengthening systems for measurement of learning. The initial advances were made in the developed countries with the introduction of measures such as Trends in International Mathematics and Science Study (TIMSS), Programme for International Student Assessment (PISA) and Progress in International Reading Literacy Study (PIRLS). These international learning assessment instruments have increasingly been adopted in developing countries, supplemented by the more recent Early Grade Reading Assessment (EGRA) and Early Grade Maths Assessment (EGMA), or adapted to become part of a national assessment system. Access to education is increasingly being defined as ‘access to Quality Education’ and Education Plans are including facility for encouraging and measuring the quality of the education system. The Dakar Framework for Action in 2000, saw a new emphasis on ‘access and completion’ as key concepts in measuring achievement of UPE.

**Impact on EMIS:** EMIS must store and report on information pertaining to learning outcomes and completion rates as well as enrolments. Learning outcomes should be comparable between schools, regions and also, if possible, internationally. In particular, EMIS should have some information on standardized learning assessments for numeracy and literacy for early and intermediate years. There should also be standardized assessment results for final year basic education and upper secondary education. Many governments also store information on year 6 assessments however these are often not standardized between blocks or districts but are designed locally thus making results
incomparable between regions. In addition EMIS must distinguish between children who enroll in education and those who complete education.

2.3.6 Planning Emphasis on Equity

**Change:** Both international communities and local governments have driven a change for greater emphasis on equality whereby marginal and disadvantaged groups are clearly addressed in education planning. This includes geographic (mainly by region, state or district, urban/rural/island location), population group (including ethnic, cultural and religious minorities and nomads) and crisis-affected (including displaced persons, refugees, and war affected).

**Impact on EMIS:** EMIS should be able to report on key indicators disaggregated by factors of equality including gender, disability, ethnic group or caste, location and crisis affected groups. U-DISE collects data on numbers of enrolments and other attributes using aggregate data and attempts to collect information to enable reporting on equity. As a result, the U-DISE form is long and complex when compared to other census forms and requires substantial effort by school principals to complete. Systems which store individual student data can easily report on all equity indicators provided that data is collected on each pupil. However as noted in section 10.9, this requires the state to implement a student tracking system which, whilst very useful, requires substantial effort.

2.3.7 Monitoring intermediate Indicators of Quality

**Change:** There is a global recognition that enrolling a child in school is no longer sufficient to ensure a child completes the education cycle. Students cannot perform well academically when they are frequently absent. An individual student’s low attendance is a symptom of disengagement and academic difficulties. But when many students have low attendance in classes, such behavior undermines the capacity of all students and teachers to pursue high quality education. Every student absence jeopardizes the ability of students to succeed at school and schools to achieve their mission. Academic achievement scores are correlated with school attendance. Excessive school absence is a precursor of school dropout. Some youngsters who are truant from school engage in behaviors that are illegal; and the negative correlates related to school attendance problems go on and on. Each school, district, and state have statements of policy regarding attendance.

**Impact on EMIS:** A good EMIS should monitor attendance of students in school at least by class and gender. It should be able inform administrators of why children are absent, the rate of severe and chronic absence, and help inform interventions to limit truancy or other form of absence. Monitoring absenteeism on a weekly, monthly or term basis is also a good way to continuously engage schools in the EMIS and also Block level administrators who should be closely monitoring schools to identify issues of severe or chronic absenteeism.

2.3.8 Increasingly Complex Education Funding Mechanisms

**Change:** Funding mechanisms for education have become increasingly complex. In many states of India there has been a growth of private and partially funded schools. Since 2000 there was a growing trend within the international development community away from project based support towards general sector and budget support. In many cases different government programs may be funded by different partners who all require detailed information in order to be able to monitor and evaluate program effectiveness in achieving goals. This places even greater emphasis on the availability of robust and precise education plans, particularly strong MTSP and MTEF. These shifts place emphasis on the development of robust systems which can inform well-structured sector plans and expenditure frameworks.
**Impact on EMIS:** EMIS reports should be accessible to a range of stakeholders some of whom may fall outside of the Department of Education. Reports should be able to respond to most program monitoring and evaluation needs and in for many needs, should be able to align financial information with other information.

2.4 What Are the Characteristics of a Good EMIS?

2.4.1 Overview

Obtaining good data is often one of the most formidable challenges towards effectively managing the education sector. A good EMIS will be designed to ensure that current, complete and accurate data is provided to those requiring it in a cost effective and timely manner. This section helps you to identify some of the characteristics of a good EMIS. In general a good EMIS:

1. Ensures Data quality and coherence
2. Ensures Data is Easily Available
3. Resolves Conflicting Data
4. Ensures Data is Complete
5. Ensures Data is Relevant
6. Ensures Data is Accurate
7. Ensures Data is Timely
8. Ensures Data is Useful
9. Ensures data can be Compared (Is Integrated)
10. Is Decentralised for Data Management
11. Brings Information back to the Producer of Data
12. Is Accessible to people requiring the Data

This guidebook will help you to develop and manage an EMIS which helps address these common data issues. Each of these points is described in more detail below.

2.4.2 Ensures Data quality and coherence

**Problem:** Data may be derived from a multitude of not sufficiently coherent data sources which use different approaches in terms of terminology, definitions, collection schedules and coverage, analysis and projection methodology. Making sense of data and bringing it together into a coherent picture of the education system can often be a challenge.

**Solution:** A good EMIS will help address these issues and will be based on robust data standards which enable comparison and merging of data between different sub-systems.

2.4.3 Ensures Data is Easily Available

**Problem:** In many cases, particularly in states with large numbers of remote or inaccessible schools, many items of data required for the education management may not be available. For example in many states of India, data on student performance through standardised assessment is not available or standardised assessment may not have been performed with any regularity.

**Solution:** A good EMIS will address these issues by being designed to capture all required data that can be produced annually.

2.4.4 Resolves Conflicting Data

**Problem:** In many cases, data obtained from different sources may not correlate. For example, data from U-DISE may not match data from the State Payroll systems. This is particularly evident in states...
with weak information systems whereby regional offices, such as districts or blocks, operate different systems for different purposes. For example: often enrolment data is collected on a more frequent basis using different tools at the block level than the state level and may vary significantly. Sometimes different sets of population data are used.

**Solution:** A good EMIS will be rationalised so that each data item is captured only once. This will enable more resources to be applied to the verification of data and will help avoid conflicts in data.

### 2.4.5 Ensures Data is Complete

**Problem:** In many cases data will only be partially available. This may be the case for financial data where the real costs of the system are often hidden in parent contributions and school fees. A good EMIS will attempt to ensure complete data is available. Using the example above, EMIS should capture financial contributions to each school. If the private sector is not accommodated in planning then participation rates and projections will be wildly out. An incomplete or partial presentation of information can lead to decisions that don’t have the anticipated effects.

**Solution:** A good EMIS will be designed to ensure those gaps are addressed. Strong policy and legislation should support EMIS to help ensure all required data is reported and made available through the system. An effective EMIS presents all the most relevant and useful information for a particular decision. If some information is not available due to missing data, it highlights the gaps and either displays possible scenarios or presents possible consequences resulting from the missing data. Education Managers can either add the missing data or make the appropriate decisions aware of the missing information.

### 2.4.6 Ensures Data is Relevant

**Problem:** The information an Education Manager receives from an EMIS has to relate to the decisions the manager has to make. Often data will be presented in ways that obscure or fail to highlight problem situations.

**Solution:** An effective EMIS takes data that originates in the areas of activity that concern the manager at any given time, and organizes it into forms that are meaningful for making decisions. If a manager has to make pricing decisions, for example, an MIS may take sales data from the past five years, and display sales volume and profit projections for various pricing scenarios.

### 2.4.7 Ensures Data is Accurate

**Problem:** Education Managers and other stakeholders will quickly become disillusioned with an EMIS that consistently displays inaccurate or poor data. If this occurs there is a high risk that users will cease to use data to help validate decisions and will revert to practices of using other criteria such as personal knowledge or preference.

**Solution:** A key measure of the effectiveness of an EMIS is the accuracy and reliability of its information. The accuracy of the data it uses and the calculations it applies determine the effectiveness of the resulting information. A good EMIS will use validation rules to help highlight invalid or likely inaccurate data. A good EMIS will also be supported by effective validation processes whereby data is regularly checked at the source. The sources of the data determine whether the information is reliable. Historical performance is often part of the input for an EMIS, and also serves as a good measure of the accuracy and reliability of its output.
2.4.8 Ensures Data is Timely

**Problem:** EMIS output must be current. Education Managers have to make decisions about the future of the education system based on data from the present, even when evaluating trends. The more recent the data, the more these decisions will reflect present reality and correctly anticipate their effects on the education system.

**Solution:** When the collection and processing of data delays its availability, the EMIS must take into consideration its potential inaccuracies due to age and present the resulting information accordingly, with possible ranges of error.

2.4.9 Ensures Data is Useful

**Problem:** The information an Education Manager receives from an EMIS may be relevant and accurate, but it is only useful if it helps him with the particular decisions he has to make. For example, if a manager has to make decisions on which schools to merge or further develop, information on resulting cost savings or increments is relevant, but information on the performance of the schools and the extent to which communities in the region are being serviced are possibly more useful. Given the importance of its use, it is important to emphasize that information produced by EMIS should be user-oriented and user-friendly, and should not be like traditional statistical services which tend to produce data from the producer's point of view and often do not consider information needs and purposes of users.

**Solution:** A good EMIS has to make useful information easily accessible. A good EMIS will present data in such a way as to turn it into information that can be used for planning. A good EMIS will present each user with the information that they require and not extraneous information.

2.4.10 Ensures data can be Compared (Is Integrated)

**Problem:** In many Departments of Education different systems will have evolved over time using different data standards. The different systems will often sit in isolation. An individual or group of individuals may have access to student achievement data and another group will have information on teachers and their qualifications in school. If you want to compare student learning outcomes with the number of qualified staffs teaching in a school then you may have to go to different data sources to extract and compare the information. This will likely be time consuming and there will probably be issues that arise when trying to match and compare data from different sources.

**Solution:** A good EMIS will be integrated and will enable easy merging and comparison of different data from different data sources. The best EMIS are often based on a single database accessible to users online and enable each user access only to the data that they require and not other data.

2.4.11 Is Decentralised for Data Management

**Problem:** In many states throughout India the schools do not have sufficient expertise, systems or hardware and internet connectivity to be able to manage data themselves. Therefore schools usually submit paper forms to the block Education Department who are then responsible for data entry. Data may be missing, incomplete or misinterpreted in which case it is often too time consuming to go back to the school to confirm missing or incomplete data.

**Solution:** Entry of all data should be as close to the source of the data as possible. If possible head teachers or an assigned staff member at the school should be directly managing the schools data in EMIS via the internet. If this is not possible then someone familiar with the school should be managing the schools data at the block level such as the schools supervisor or administrator. In the best systems,
individual teachers can access an EMIS at the school to help manage data on individual pupils such as attendance and examinations data.

2.4.12 Brings Information back to the Producer of Data

**Problem:** An EMIS can turn data into information. Raw data is simply numbers whilst Information tells us something about the education system. If the producers of data are not engaged in the system and do not see the purpose of the data then problems may result. Users will quickly become disallusioned by the need to endlessly provide data and complete forms without getting anything back in return.

**Solution:** The best EMIS will return data as information to the producers of the data. School level operatives are often the producers of data. One method for returning data to the school involves annual production of school report cards. A good school report card can help with school development planning and can help the head teacher communicate with stakeholders such as the School Management Committees and Parent and Teachers Association. How the school is progressing and the development status of the school can be highlighted in relation to other schools in region and in relation to national norms and standards. Graphical output can often help highlight disparities or relationships between data.

2.4.13 A good EMIS Development Strategy

The above solutions can be summarised in the following paragraph. To strengthen capacities in management, planning and dissemination of information at all levels and areas of decision-making, the a good EMIS development strategy has to:

a) Improve capacities in collecting, processing, storing, analyzing, and disseminating data in order for decision-makers, managers and educators to base their judgement on timely and reliable data;

b) Coordinate the dispersed efforts in acquiring, processing, analyzing and disseminating education data and information;

c) Rationalize the nature and flow of information necessary for decision-making by reducing and eliminating duplications;

d) Link and assemble different existing data and information systems;

e) Work towards integrating in one single system the quantitative and qualitative data; and

f) Adapt data collection, and the use and dissemination of information to the constantly evolving needs for information.

These features should be captured in a good EMIS development strategy. This document will help guide you as to how to develop a good EMIS Development Strategy.
3. The Architecture of a Good EMIS and its Components

**Goal:** To gain a high level understanding of the components of a good EMIS and how they can be arranged to help rationalise data collection and processing, and to maximise the benefits of EMIS.

### 3.1 Overview

It is important to understand in general how a state Education Management Information System should be assembled and how the different sub-systems and tools can fit together. The following section offers a very general and high level overview of how an EMIS can be structured. The specific relationships between the different components will be highly dependent on the financial and technical resources available locally as well as the capacity for different actors such as head principals in schools, to engage with the EMIS electronically. This section is not intended to be a detailed design for an EMIS which is beyond the scope of this document. Rather it is intended to give a general overview of EMIS so that the state Department of Education can make decisions on which systems should be implemented and over what time period.

### 3.2 High level Architecture of a good EMIS

#### 3.2.1 EMIS High Level Architecture

The diagram below depicts the general high level architecture of an EMIS. As noted in the diagram below there are five main components to an EMIS. Each of these are detailed in general below and then more specifically in the following sections. There are options as to how the overall architecture will function which are based on technical issues discussed in the section below.

**Figure 2. High level Architecture of a good EMIS**

1) **EMIS Sub-Systems:** The EMIS sub systems are the different ministry information systems with which most users interact. The nature of the systems will vary department to department based on a range of factors including financial and material resources available to the Department. Each of these sub-systems will perform separate functions and may cater to specific users. Examples of EMIS sub systems include Human Resource Information Systems (HRIS), inventory management systems, Student Tracking Systems and School Information Systems. Data from the Sub-Systems will either be integrated together in the central EMIS or will be exported to the data warehouse depending on the resources available (see section below).

2) **EMIS Data Warehouse:** The EMIS data warehouse is the central data store for all education data. In theory this should be the U-DISE but as noted below, the U-DISE has technical issues and may not be suitable for all Departments of Education. The main benefits of archiving data in a data warehouse are...
to enable easier access to query and report on the education data. A data warehouse can make it easier to compare data year to year particularly where large volumes of data are present in sub-systems.

3) U-DISE: The U-DISE is the national data standard for Education Data to which all states must comply and submit data to the National University of Education Planning and Administration (NUEPA) on an annual basis. In theory U-DISE should receive data from the EMIS data warehouse however in practice an annual census is operated nationally to populate U-DISE. This is discussed further below.

4) Analytical Tools: As noted in Chapter 2, EMIS data is required when analysing the education sector, undertaking education planning, monitoring and evaluation or evaluating the implementation of programs and policies. Often a range of specialised tools must be employed to work with EMIS data and enable proper analysis. In most cases, data is exported from the EMIS data warehouse and analysed using analytical tools. The most common of these tools are detailed further in sections below.

3.2.2 Architectural Choices

The high level architectural model presented above depicts a common layout for an EMIS however there are variations on this which are dependent on resources available to the state. Data Warehouses can be difficult to maintain as they require sub-systems to adhere to specific data standards and formats so as to enable archiving of data in the data warehouse. If the data structure of the sub-system changes then technical changes may be required to the interface between the sub-system and the data warehouse. In some states it may be possible to structure EMIS to do away with the EMIS Data Warehouse and function directly from sub-systems. This is possible under two circumstances:

1) In states with a smaller number of schools and with resources to procure and operate a powerful server, it may be possible to dispense with the EMIS data warehouse and to work from fully integrated EMIS sub-systems. If the system can function quickly using all data available in sub-systems then a single integrated system working from all data could operate in place of a data warehouse.

2) In states unable to operate sub-systems a single EMIS data warehouse populated by an annual census will have to be sufficient until such time as sub-systems can be developed. A state could even use U-DISE as the sole source of data however there are limitations on this as noted below.

As noted, the choice of architecture depends on which sub-systems the Department of Education can operate. The choice of sub-systems depends on a range of capacity related factors including infrastructure, internet connectivity to schools and capacity of actors at lower levels of government such as Block Education offices and schools to be able to interact with the systems.

In all cases above, expert technical analysis and advice should be sought prior to making architectural decision on an EMIS.

3.3 EMIS Sub-Systems

3.3.1 Overview

A sophisticated EMIS will be comprised of a number of sub-systems. In a fully integrated EMIS these sub-systems will all derive data from the same database and will only appear as separate systems to the user. This is the optimal method however many EMIS will be comprised of different systems. Sub-systems may be separate because different sub-sectors of the education system are managed through different Departments or it may be because some systems, such as Human Resource Information Systems (HRIS) or Financial Management Information Systems (FMIS), are operated by another Department such as the Department of Finance. This section covers the most common modules in an EMIS. The list is far from exhaustive as evidenced by the system operating in Madhya Pradesh which has many sub-systems. The number of sub-systems and the division of sub-systems
will depend on the functionality being implemented in each state EMIS. The list below represents common sub-divisions used in other countries. This section includes a brief introduction to the following sub-systems:

1) Student information system (SIS)
2) School Information System
3) Instructional or Curriculum Management System (CMS)
4) EMIS and Human Resource Information Systems
5) Financial Management Information System and Payroll
6) School Inspection System
7) Student Assessment Information System
8) Attendance Monitoring System
9) Asset Management System

As noted above, this list is far from exhaustive. Some practitioners may consider some of the above system to be modules. For example student attendance, student assessment and student tracking systems could be argued to be modules under a good School Information System. They are listed separately below to emphasise their importance and because each represents a significant step towards developing a world class EMIS.

There are a range of other systems such as library monitoring systems and textbook procurement systems. Most of these systems would be functions, attributes or modules of systems listed above. For example a textbook procurement system may be part of an asset management system or a financial system. There is no clear way to define all systems and specific needs may arise which require a new module or system to be developed.

3.3.2 Student information system (SIS)

A student information system (SIS), also called a student management system, school administration software, student tracking software or student administration system is a management information system for education establishments to manage student data. Student Information Systems (often abbreviated as SIS systems) provide capabilities for registering students on courses, documenting grading transcripts and results of student test and other assessment scores, build student schedules, track student attendance, and manage many other student-related data needs in a school. A SIS should not be confused with a learning management system or virtual learning environment, where course materials, assignments and assessment tests can be published electronically.

Students are registered in the system in the first year of their academic career and are assigned a unique student identifier. The students biodata will be entered in the system including equity related data such as whether the child has a disability. At the beginning of each year the school will then note whether the student has transitioned, dropped out, repeated or any other event such as the childs death. A process must be in place to facilitate transfer of a student to another school. The student must be changed from one school to the other in the SIS.

The main phase of implementing a student tracking system is the entry of baseline data which requires all data for pupils to be input in the first year the software is active. Following the first year only student details of new entrants need be input in the system whilst students in the system simply have their status updated. Ultimately there is less data to manage in a student tracking system than in a school census system.

However it should be noted that student tracking systems usually only work effectively if the school can input and manage the student data. This requires the school to have adequate capacity in terms
of human resources, internet and computer hardware. A SIS can be partially implemented meaning that some schools can lodge enrolment data through and SIS whilst those schools without capacity can lodge enrolment data via census and other forms. Gradually schools can be brought onto the SIS until all schools lodge data on individual pupils.

The best student tracking systems also record student achievement and student absenteeism (see below) and also engage the parents in the learning of the child by allowing parents to view a child's progress at school and even which homework assignments the student has pending.

### 3.3.3 School Information System

A School Information System is very similar to a Student Information System however a School Information System also facilitates management of the school in other areas such as asset management, teacher scheduling and library management. A School information system helps manage and retain the information at school level including data on students (school entrance, attendance, academic achievements, etc.), teachers (individual profile of teachers), finance (school budget and expenses), physical facilities (quantity and quality of school building, classrooms, furniture, equipment, etc.). Usually information from such system are consolidated and fed into other M&E systems such as EMIS Data Warehouses.

Functions which a sophisticated SIS can manage include:

- Maintenance and reporting of student data
- Handling inquiries from prospective students
- Handling the admissions process
- Enrolling new students and enabling online scheduling
- Student accounts and financial aid processing (see student financial aid)
- Automatically creating class and teacher schedules
- Handling records of examinations, assessments, marks, grades and academic progression
- Maintaining records of absences and attendance
- Recording communications with students
- Maintaining discipline records
- Providing statistical reports
- Capabilities to operate multiple campuses, online and on-ground, in multiple countries and languages
- Housing, dorms and facilities details, assignments and tasks
- Communicating student details to parents or other persons authorized by the student, through a portal
- Special Education / Individual Education Plan (IEP) services
- Career services management for student portfolios and matching with potential employers
- Human resources services[citation needed]
- Accounting and budgeting services[citation needed]
- Student health records
- Canteen Management[citation needed]
- Transportation Management
- Fees Management
- Inventory and Assets of the school
- Payroll processing for the Staff in the school[citation needed]
- Regulatory reporting and reports for accrediting bodies
- Annual School Information

The advantages of operating a SIS are many and include:

a) Significantly increased capacity to analyse the education sector and determine the progress of policies programs and plans and compare different schools and even classes.

b) Having a centralised store of all student details and their full academic record.
c) Beign able to have accurate data on students and their learning outcomes. Census forms are problematic and head teachers often make mistakes or can inflate or otherwise manipulate figures whereas student tracking systems contain individual pupil data and are therefore less prone to error and more likely to be consistent year to year.

3.3.4 Instructional or Curriculum Management System (CMS)

Instructional or Curriculum Management Systems (CMS) support teachers and students in teaching and learning processes. These systems are not usually a part of EMIS but are included here for reference. A CMS provides a unifying framework to support access to learning standards, curriculum and instructional materials, such as online learning materials, model lesson plans, assessment tools, performance standards, collaboration tools, etc.

This data system is very relevant for pedagogical purpose and aims to directly support teaching and learning process, therefore improving student learning. However, it is not a system that allows for producing statistical information, administration of educational service provision and management of resources.

3.3.5 EMIS and Human Resource Information Systems

Human Resource Information Systems (HRIS) are a subset of MIS which support complex Human Resources (HR) practices now evident in education ministries. A human resources information system collects and manages information used in HR decision-making. A complete HRIS links all human resources data from the time professionals enter pre-service training until they leave the workforce. Typically, the system is computerized and consists of a database for storing the information, software for entering and updating data, and reporting and analysis tools.

A simple HRIS may rely on paper forms or on electronic files such as spreadsheets housed in different departments that do not link together, but such a system often does not adequately meet the education department or system’s needs. Putting in place a computerized, integrated HRIS achieves the following objectives:

- Improves the accuracy and availability of HR data
- Tracks people as they move through the education workforce system
- Decreases the labour required to maintain the HRIS
- Quickly aggregates and uses data
- Reports on and analyses data regularly
- Projects workforce needs into the future.

The goal of HRIS strengthening is to progress from any systems that are currently in place—retaining the processes that are working while improving weaker parts and filling in gaps—to a complete and mature HRIS.

HRIS are able to assist education managers to focus on enhancing education outcomes and the performance of the education system and to assist with management of the human capital, principally staff employed in education institutions (Ostermann, Staudinger & Staudinger, 2009).

Ministries (and Departments) of Education should establish HRIS with supporting databases in order to provide for the proper planning of teacher development activities, and to be able to target teacher professional development in the most efficient and effective manner. One of the main benefits of such a system is to strengthen the ability to deploy, monitor and supervise teacher performance.

Two main benefits of Ministries of Education deploying proper HRIS are to ensure:

a) Adequate information is available on teacher skills and competencies to facilitate skills enhancement programmes.
b) A balanced provision of good quality education in all schools in each state of India through a just and fair teacher allocation as well as a just and fair utilisation of the teaching resource.

A good HRIS can generate accurate and comprehensive data on the key dimensions of teacher quality and is able to provide detailed data, beyond mere numbers, in order to facilitate decisions relating to continuous professional development and to meet the needs of a teacher workforce with varied skills and varied deployment needs.

A well-developed Human Resources Information System should help teachers develop the professional skills they need to teach challenging curricula to diverse students, including students who typically have not achieved well and should help facilitate many processes associated with teacher management. A well-developed Human Resources Information System should help improve teacher satisfaction and ease the administrative burden of managing large numbers of staff in diverse learning environments.

In addition to helping teachers, Education Managers can use a HRIS to monitor and analyse the recruitment, allocation and compensation of teachers and other staff. Operational management uses HR systems to track the recruitment and placement of the teachers and other staff. HRIS can also support various HR practices such as teacher deployment planning, teacher flows, compensation and transfer programs, salary budget forecasts, pay budgets and assist develop and streamline teacher/management relations.

Guidelines to Development of Human Resource Information Systems have been developed for Indian State Ministries of Education Highlighting design, implementation and QA processes. This document should complement these guidelines and can be used in conjunction to help develop your EMIS (RMSA TCA 2015b).

3.3.6 Financial Management Information System and Payroll

A Financial Management Information System (FMIS) accumulates and analyses financial data in order to make good financial management decisions in running the Education System. A FMIS should facilitate the Department of Education to meet its fiscal obligations as they arise, using the minimal amount of financial resources consistent with an established margin of safety. Outputs generated by an FMIS include accounting reports, operating and capital budgets, working capital reports, cash flow forecast, and various What-If Analysis reports. The evaluation of financial data may be performed through ratio analysis, trend evaluation, and financial planning modelling. Financial planning and forecasting are facilitated if used in conjunction with an EMIS.

A good FMIS will support adequate reporting, policy decisions, fiduciary responsibilities, and preparation of auditable financial statements for the Education System. A FMIS can include modules for: General ledger; Budgetary accounting; Accounts payable; Accounts receivable; Payroll system; Budget development; Procurement; Project ledger; Asset management.

The government of India has mandated that all State Governments develop state FMIS which also manage payroll for government employees. Therefore the Department of Education should be operating under the national FMIS and Payroll system.

State FMIS will usually record only contributions made on the vertical level to the school which are funds given by the government for the operation of schools. This can include the school discretionary budget, staff salaries, provisions of equipment and pedagogical materials, repairs and construction and any other items that the state government or national government fund. Under the state government FMIS it is likely that contributions to the operation of schools at the horizontal level
(community, parents, NGOs) will not be recorded in the FMIS. It may also be the case that funds which are contributed by development partners such as school or student grants, are not recorded.

It is important to capture all financial contributions to the school as well as to record the expenditure along expenditure budget lines. It is important to understand what funds the school receives and how it expends funds. This will allow proper analysis of the education sector. Therefore it may be necessary for the Department of Education to operate an additional financial system for the management of school accounts or at the very least for the recording of school income and expenditure. This data is presently partially captured via the U-DISE school census forms.

It will also be important for the Department of Education to reconcile the Payroll database with its own HRIS. This issue is discussed further in the Guidelines to Development of Human Resource Information Systems which have been developed for Indian State Ministries of Education Highlighting design, implementation and QA processes (RMSA TCA 2015b).

3.3.7 School Inspection System

A school inspection system should help to facilitate school inspections and should enable school inspectors to record quality inspection results into the EMIS. A good school inspection system can help encourage proper school inspections which can lead to better management of schools and those staffs operating in schools. A School Inspection System should:

a) Help facilitate the scheduling and operation and completion of school inspections.

b) Help communicate school inspection results.

A good School Inspection System should inform inspectors when schools are to be inspected. There should be a report on the school that the inspector can print and take to the school to help verify school records and facilitate discussion of the status of the school with the Head Teacher and other actors at the school level such as teachers and School Management Committees. The report can show how the school is progressing compared to other schools in the region and against state education standards.

A good School Inspection System should also require the school inspector to log their report electronically in the EMIS. A good inspection report should allow for rating of the school along different themes such as classroom engagement, quality of facilities etc. These ratings can be logged in the EMIS to enable additional indicators of school quality to be generated. Schools can thus be ranked on their inspection ratings to help inform interventions that may help the school to develop.

3.3.8 Student Assessment Information System

The impact of assessment on students’ learning has been widely documented (Rust 2014). In the context of a worldwide paradigm shift towards student-centred outcomes-based approaches, and at a time when many Departments of Education are developing learning, teaching and assessment strategies, monitoring of student learning outcomes is of critical importance. A Student Achievement Information System (SAIS) is a system that can assists teachers, education managers and other staff to analyse student achievement.

The simplest student achievement systems will record average grade results by gender at certain intervals through the education system. These intervals are usually at points where some form of standardised assessment occurs such as district or state examinations. Usually these assessments occur at completion of cycles of the education system such as the completion of primary, lower secondary and upper secondary.
The most complex student achievement systems record student achievement on all exams, tests and assessments undertaken throughout the academic year and for all academic years and for each student individually. These systems may also make this data available to parents. These types of systems are usually part of Student Tracking Systems and require schools to have capacity to operate the system or access the system via the internet. Therefore they may be prohibitive to implement for some years to come for many Departments of Education. As in the case of Student Tracking Systems, these systems do not have to be deployed to all schools in a single year. Rather they can be rolled out gradually over the course of a number of years and as schools develop capacity to be able to manage individual pupil data.

Many Ministries choose to implement systems that are in-between the two extremes. They record individual pupil achievement but only at intervals throughout the academic lifecycle. It is important to note that comparisons between years and between schools can only be made when a standardised assessment methodology is used and applied equally to all schools. For examinations and assessments undertaken throughout the year and developed by each school separately, there is only purpose in recording results when actors at the school have access to the Student Tracking System and can use it to help analyse the data to identify under and over performing students to help develop suitable interventions and customise the learning process for individual students.

3.3.9 Attendance Monitoring System

The importance of monitoring student attendance is discussed in section 2.3.7. Capturing student Attendance is similar to capturing student assessment results. In its simplest form attendance rates can be captured by grade and gender once a term. Attendance rates can be captured by simple forms distributed to schools asking:

a. Number of pupil days of absent in a term by grade and gender. EMIS will already have enrolments to enable you to calculate attendance rates.

b. Number of pupils critically and chronically absent per term by grade and gender.

The most complex systems capture attendance by child each day. The teacher must note if a child is absent and the reason for absence on a daily or weekly basis. These systems are capable of providing real time attendance data that can be used by administrators to monitor the success of intervention policies such as subsidies and grants for disadvantaged children. Because attendance data is available on each student, attendance rates can be analysed in relation to the biodata and achievement data of children. For example, the attendance rate of low income or children with disabilities can be monitored using this type of system. This type of system works through a student information system and to capture such detailed information schools require capacity to access and use the system on a regular basis. Fiji is an example of a country that employs this type of attendance monitoring system (Shoobridge 2014).

In between these two extremes are systems that collect attendance on a weekly and a monthly basis either on individual students or by class or grade and gender. These types of systems are less intensive for data collection. It should be possible for block level education administrators to monthly input and report on attendance rates for each school.

Teacher attendance can also be monitored in this way and in many developing environments has significant impact on student attendance. However there is often resistance to capturing teacher attendance data from bodies such as teacher unions.

---

5 For a definition of standardized assessment refer: [http://edglossary.org/standardized-test/](http://edglossary.org/standardized-test/)
### 3.3.10 Asset Management System

An asset management information system is a computer based information system which is designed to assist the user to create and maintain documentation for asset management. Financial management systems often include asset management functions. The asset management system will often include:

a) An asset Register including listing of maintainable assets
b) Routing maintenance lists
c) Routine maintenance prompts
d) Work requests
e) Work order management
f) Data logging
g) Estimating costing and cost reports
h) Budget and Budgetary reports
i) Spare parts and consumables inventory management
j) Suppliers and purchasing data

An asset management system can also be used for supply of needed pedagogical materials such as textbooks and teachers guides. The nature and deployment of an asset management system will reflect the extent of decentralisation of roles and responsibilities for related functions such as procurement, repairs, construction and other functions. If schools are responsible for these functions then the asset management system should function at the block or school level. If the district is responsible for these functions then the asset management system should function at the district level.

### 3.3.11 Annual School Information

Annual school information is a very general term which refers to any information not captured in the systems detailed above and which is required to be captured to conform with the national data standards of U-DISE and to inform planning, monitoring, evaluation and administration of the education system. This information should be captured and stored on an annual basis in the EMIS Data Warehouse.

### 3.4 EMIS Data Warehouse

In computing, a data warehouse (DW or DWH), also known as an enterprise data warehouse (EDW), is a system used for reporting and data analysis. DWs are central repositories of integrated data from one or more disparate sources. They store current and historical data and are used for creating analytical reports for knowledge workers throughout the enterprise. Examples of reports could range from annual and quarterly comparisons and trends in enrolments, facilities and provision of teachers. An EMIS data warehouse comprises data derived from a variety of sub-systems. The benefits of drawing all data together into a single data store are speed, efficiency and access to data which may otherwise be stored in separate sub-systems.

The data stored in the EMIS warehouse is uploaded from the operational systems such as Human Resources Information System (HRIS) or Student Tracking System (STS). The data may pass through an operational data store for additional operations before it is used in the DW for reporting.

U-DISE is a form of data warehouse and may be suitable to use as the EMIS data warehouse. However owing to technical reasons, there are limitations on the capacity states have to report on information from U-DISE and to be able to undertake validation and data completeness, quality and integrity
testing. Therefore these guidelines recommend that you develop a separate EMIS data warehouse and use that to export data to U-DISE as required annually. As noted above, the other option is to not have a data warehouse and work from fully integrated sub-systems. This requires a powerful server to be able to manage the large amounts of data without slowing down. A slow system will result in disillusioned users who may stop using the system if problems persist. As noted above technical advice should be obtained prior to making these decisions.

3.5 EMIS and U-DISE

3.5.1 About U-DISE

The Unified District Information System for Education (U-DISE) was introduced in 2012-13 as the national data minimum standard for Education Data obtained from schools. It is an integrated version of the former elementary-level DISE and the secondary-level SEMIS. States are required to use U-DISE data for their Annual Work Plan and Budgets (AWP&Bs) and periodic reporting. MHRD also uses U-DISE data to verify and appraise the state plans under SSA and RMSA, and NUEPA publishes the national level statistics for elementary and secondary school education data through its various publications. U-DISE is the data standard for capture of school level data throughout India for both public and private schools for subsectors ranging from Kindergarten to Upper Secondary education.

U-DISE is operated by SSA & RMSA staff at the state and sub-state level. It is technically developed and maintained by NUEPA. Information and reports from the database application are also available online through the following links:

- [www.schoolreportcards.in](http://www.schoolreportcards.in) (for school-level data)
- [www.dise.in](http://www.dise.in) (for district- and state-level data)

The system uses a single integrated Data Capture Format (DCF) which is filled in by the schools. Data entry of the U-DISE DCF is normally done at Block level (also at District level in some cases). In each state, data are collected by SSA & RMSA Implementation Societies through about 70,000 Cluster Resource Centres and 7,000 Block Resource Centres with support and supervision of District offices and other SSA and RMSA personnel working at different levels.

More than 13 lakh schools imparting elementary education and around 2.3 lakh Secondary and Higher Secondary schools (including private un-aided schools) across the country were covered during the U-DISE 2013-14. 30th September each year is date of reference for data collection.

NUEPA annually publishes several publications, such as ‘District and State Report Cards’; ‘Annual Flash Statistics, for both elementary and secondary levels’, ‘Thematic Maps’; and Analytical Reports & Tables’.

At present, U-DISE uses a single integrated Data Capture Format (DCF) which is filled out by schools. Data entry starts normally at block level (also at district level in some states) and is further validated, collated and compiled at district level. The data from all districts is then verified and finalised at state level before it is shared with NUEPA, MHRD. Comprehensive guidelines have been developed which detail the Data Capture Form (DCF) (RMSA TCA 2014)

The U-DISE form is similar to census forms used in many countries in that it collects aggregate data on facilities, finances, pupils and other items of interest to planners. U-DISE also collects data on individual teachers. In principal U-DISE would be a suitable EMIS Data Warehouse in which to archive and report all education data however in practice there are technical obstacles that limit its effectiveness as detailed in the sections below.
3.5.2 Problems with U-DISE

U-DISE stores single year census data in single database for all schools throughout India. In other words, data for separate years are stored in different databases. U-DISE is centrally deployed from the National University of Education Planning and Administration (NUEPA). The application and database are client server and are not deployed over the internet. States have access to all data for their state and manage U-DISE from the state department of education. U-DISE should be active in all blocks and districts in a state.

Data is stored in separate databases for separate years. This is not a good method. To some extent the data builds on itself as data from the previous year can be carried forward to the current year as in the case of teachers. However there are obvious disadvantages to this method of storing data. Historical data is very difficult to extract and compare and a teacher’s service history is extremely difficult to determine using this method. Trends and summary data across years involves handling different databases and the potential for discrepancies between years.

The U-DISE uses the School Code to identify a teacher and not a proper teacher code. This means that teachers cannot be properly and uniquely identified year to year.

There are other issues with the way U-DISE collects and store data that make it problematic as a source of data without some changes.

1. The lack of stability in the U-DISE coding system which is linked to the geographical location of the school and hence subject to change. This makes it hard to consistently identify an institution between school years.
2. The storage of individual teacher data in U-DISE has no proper coding system and repeats data for the entire year in a separate database for each year. Thus the database is not properly relational and cannot be easily examined or queried.

For these reasons U-DISE has limitations as an EMIS Data Warehouse. It is therefore recommended that data be captured through sub-systems and archived in an EMIS Data Warehouse and exported to U-DISE annually to comply with National Data Standards and Requirements.

3.5.3 Using U-DISE as an EMIS Data Warehouse

U-DISE software and data standards are managed by NUEPA. This means that State Departments of Education cannot easily adjust U-DISE to function as the EMIS Data Warehouse. However U-DISE can be made to function as a data warehouse but care will have to be taken in the management of education data to be stored in U-DISE. This is especially more relevant now given NUEPA’s push to make state specific information available through the use of Supplementary Variables (in UDISE Software) as well as creating provisions for States to enter child-wise data in UDISE. NUEPA has recently provided access to State Departments to directly fill in child wise data in UDISE. This will significantly expand coverage of UDISE for Education related data because up till now it was lacking in capturing child wise data.

The following should be adhered to if using U-DISE as an EMIS Data Warehouse:

1) School codes should be both unique and consistent. School codes should not be linked to attributes of the schools which may change such as geographic location or school level. This causes confusion and ensures data is not well managed or auditable.
2) Ensure states keep consistent master lists of schools and school codes so that completion rates can be accurately reported.
3) Participation rates going back to 2011 should be recalculated using population data derived from the 2011 population census (projected where required).

Even with the above changes, there will still be issues when using U-DISE. Reporting on historical data such as reports showing time series trends in education development at the school, block, district or state level, will be very challenging to generate from U-DISE and will require development of complex queries.

### 3.5.4 How should you manage the relationship between EMIS and U-DISE?

States are required to use U-DISE data for their Annual Work Plan and Budgets (AWP&Bs) and periodic reporting. MHRD also uses U-DISE data to verify and appraise the state plans under SSA and RMSA. Therefore states should comply with U-DISE data requirements however we propose that some of the data be exported to U-DISE from the State EMIS and therefore that the annual census be used to verify data already in the U-DISE.

It is therefore proposed that:

1) States should capture and manage most of their data through EMIS Sub systems such as HRIS and STS.
2) The sub-system data should be exported to the EMIS Data Warehouse or otherwise be available through a fully integrated EMIS without need for a Data Warehouse.
3) Once per year data from the Data Warehouse or directly from the EMIS Sub-Systems should be exported to populate U-DISE.
4) The school census, as required throughout India, should be used to verify data in the U-DISE and correct data where possible.
5) Corrected data needs to be corrected in the EMIS data warehouse or EMIS sub-systems.
6) When the process is complete, the final verified data can be exported to U-DISE to ensure that the correct and verified data is sent to NUEPA and other national bodies requiring the data.

*Figure 3. High level Architecture of a good EMIS*
Whilst the process appears laborious, it is likely the only way to ensure that sub-system data will match and conform to data in the national census system U-DISE. It is hoped that in the future states can fully manage data through EMIS sub-systems and export to national level as required and in accordance with national level data standards.

3.6 Tools to Use with EMIS

3.6.1 Overview

The most common analysis required by educationists should be developed as automatic reporting from the EMIS Data Warehouse or EMIS sub-systems. However, EMIS software cannot account for every type analysis that will be required by education stakeholders. Therefore it is common to use other tools to undertake specialised analysis of EMIS data such as data mining when undertaking analysis of the entire education sector. Tools can be either link directly to EMIS Data Warehouse or sub-systems or data can be exported from the EMIS Data Warehouse and EMIS Sub-Systems to enable direct analysis using tools.

This section highlights some of the most common tools which are used as part of an EMIS ecosystem. The list is far from exhaustive and there are many other tools which can be applied to EMIS data which are not covered in this section. The tools covered below include:

- Demographic Financial Modelling
- Statistical Analysis Software
- Spreadsheets
- School Mapping
- U-Analyse

3.6.2 Demographic Financial Modelling

A Demographic Financial model is a comprehensive planning tool which is based upon EMIS data and which is designed to provide essential information needed for the planning process, both the policy setting process as well as the technical planning process and plan implementation monitoring. Demographic financial models are also used to produce information for international programs such as Global Partnership for Education (GPE), Fast Track Initiative (FTI), Millennium Development Goals (MDG), Poverty Reduction Strategies (PRS) ensuring coherence between these programs and the national plan. Demographic financial models are essential planning tool used for

a) policy dialogue,
b) target setting and formulation of the programs and activities of the Plan,
c) identification of resource gaps and formulation of the finance plan (for Government Medium Term Expenditure Framework),
d) setting of implementation priorities, and
e) indicators for plan implementation monitoring.

Demographic financial models are used to model scenarios for expenditure into education. By changing parameters in the model it should be possible to examine various budget scenarios and their impact on the education system. They form invaluable tools for dialogue and negotiation:

a) within the education sector,
b) between the Ministry of Education and the ministries of finance and of planning or equivalents,
c) between central and sub-national level entities; and
d) between national authorities and their international partners.
UNESCO and IIEP have produced some excellent open source demographic financial simulators which only require MS Excel to operate.

1. Sudan An Pro (IIEP)  

2. Egypt An Pro (IIEP)  

3. More on Simulation and Projection Models (UNESCO)  

4. EPS Sim – a Simulation Model from UNESCO Bangkok  

### 3.6.3 Statistical Analysis Software

Statistical Analysis Software are for statistical analysis in social science. It is used by educationalists to undertake quantitative research on aspects of education systems. Statistical Analysis Softwares are used widely by those undertaking literacy and numeracy studies. Often educationalists want to look for correlations between background variables such as location of school and qualifications of teachers, and learning outcomes. Commonly used Statistical Analysis Software package include SPSS and Stata. Statistical packages such as SPSS and Stata are ideal tools for undertaking this type of research. More information on both Statistical Analysis Softwares can be found at:

- **SPSS**  

- **Stata**  

Note that statistical analytical software require the user to understand concepts of statistical analysis and theory and therefore require expertise to operate properly. Failure to apply proper processes and parameters will result in spurious or false results.

---

6 Adapted from EPS Sim UNESCO
3.6.4 Spreadsheets

A spreadsheet is an interactive computer application program for organization, analysis and storage of data in tabular form. The most common example of spreadsheet software is Microsoft Excel. Spreadsheet software has the advantage of being widely understood and most people have access to spreadsheet software. Besides performing basic arithmetic and mathematical functions, modern spreadsheets provide built-in functions for common financial and statistical operations. Such calculations as net present value or standard deviation can be applied to tabular data with a pre-programmed function in a formula. Spreadsheet programs also provide conditional expressions, functions to convert between text and numbers, and functions that operate on strings of text.

Making EMIS data available in spreadsheets via ministry websites is an effective way to ensure that a broad range of educationalists have access to the outputs of EMIS.

The most commonly used spreadsheet softwares include:


3.6.5 School Mapping

A geographic information system or geographical information system (GIS) is a system designed to capture, store, manipulate, analyse, manage, and present all types of spatial or geographical data. In a general sense, the term describes any information system that integrates, stores, edits, analyses, shares, and displays geographic information. GIS applications are tools that allow users to create interactive queries (user-created searches), analyse spatial information, edit data in maps, and present the results of all these operations.

Recording information manually on a map is a very limited aspect of school, or any other type of mapping. A suitable desktop computer mapping system has the potential to not only place formatted data on a map, but also allows the data to be viewed in a number of perspectives leading to the exploration of relationships which would not otherwise be apparent.

The locations of schools can be mapped using Geographic Positioning Systems (GPS) and displayed on a map. The GIS software can help education planners to locate schools and analyse the relationship of schools to each other. Analysis is particularly powerful when the locations of schools are linked to EMIS data. The following are examples of the types of analysis which can be undertaken using GIS software linked to EMIS data.

- Identify new construction sites
- Plan clustering and development for single contractor construction.
- Identify possible sites for new and middle schools and/or upgrading existing primary schools.
- Identify potential school amalgamations (including gender free schools)
- Identify human settlements without schools (boys and/or girls schools).
- Analyse enrolment patterns, growth rates, dropout and retention rates, promotion rates, completion rates and student absenteeism.
- Analyse relative enrolments of Boys/Girls particularly in geographic regions.
- Provision of teacher support and Learning Co-ordinator monitoring.
- Plan, monitor and inspect visits.
- Locate sites for Teachers’ Centres and Demonstration Schools.
- Textbook and materials distribution.
- Plan teacher in-service and other training for use of new textbooks and materials.
- Locate pilot schools for textbook development.
• Plan school development centres.
• Reallocate teachers from schools with a high student to teacher ratio to those with a low
  student to teacher ratio.

Examples of good GIS software for school mapping include:

1) ESRI ArcView (http://www.esri.com/software/arcgis/arcview)

3.6.6 U-Analyse

U-Analyse is a tool presently under development in a collaboration between the RMSA TCA program
and NUEPA. U-Analyse makes data from U-DISE (Unified District Information System for Education)
accessible, bringing it together in one place to generate discussion, support better decision making
and drive improvement. You can see the education performance at state, district, block and school
levels, by category, and over time. U-Analyse will be available online for educationalists to view and
report on U-DISE data through an easy to use interface that enables the user to drill down and locate
the appropriate data and analysis. U-Analyse will also be available for state Departments of Education
to operate locally through their own websites.

3.7 Links to other Systems

An Education EMIS relies on data from other systems and can itself provide valuable information to
other systems. For example, in order to rationalise teachers amongst schools it may be necessary to
obtain data from the State Payroll System. In order to calculate participation rates detailed population
data will need to be available which will likely be under the management of the National Office of
Statistics or equivalent body.

Linking systems directly is problematic. Changes in both systems have to be coordinated. A change
in one system can result in the link creating errors and data not synchronising between two systems.
If a central state government agency is developing and hosting all e-government systems then this can
work. The NIC are one example of an agency that can develop and host e-government solutions and
can help fully integrate government systems.

An easier method is to export data from one system to another system on a regular basis using
established and agreed data standards for export and import. This is one reason why data standards
are so important (refer section 6.6.2), so as to enable the sharing of information between one
information system and another. Likewise the EMIS can derive information from the EMIS.

These linkages are important to define when modelling the data flow (refer section 6.4.6). The way in
which data can be shared will vary in each situation and is dependent on how the different databases
are hosted, who has access to the data and what methods are available to link the databases. In any
case, a software engineer should be consulted on the best options for sharing data between systems.

The state department of education should have a final vision for a unified database for all education
information systems and sub-systems. In the ideal end state, all education information systems should
derive data from a single database. In the longer term, different sub-sectors operated through
different departments should operate from unified government electronic systems. In this way it may
be possible to share an EMIS with other state departments. For example non formal and labour
market data which may not be available through the department of education.
3.8 Using Population Data and Triangulation of Data

Population data will need to be incorporated into EMIS in order to calculate participation rates such as Gross and Net Enrolment Rates. There are often issues with obtaining reliable population data. The last population census in India was conducted and published in 2011 at the time of completion of these guidelines. For years since 2011 the population census will be determined using projection models. The further from the year of the census the less reliable the population data becomes. Nonetheless historical and the latest official population figures should be stored in EMIS in order to calculate participation rates.

State Departments of Education should Triangulate EMIS data with data derived from population census and household census. This will help State Departments to identify gaps and problems in EMIS data and help build confidence behind the data. Data on both population census and Household Survey should be stored in the EMIS Data Warehouse and be available to compare against EMIS data at all levels of government.

3.9 Ensuring All Sub-Sectors Using EMIS

3.9.1 Overview

The state Department of Education must have accurate, detailed and reliable data on the entire education sector from kindergarten through to adult education. The State Department of Education requires this to help understand which communities and individuals have and do not have access to education and education opportunities so that they can utilise policies and plans to help ensure education opportunities for all persons throughout the state.

Therefore the Department of Education needs to have information on all sub-sectors of education. Often this will require having access to information, the management of which may lie outside the State Department of Education. This section includes some of the issues associated with ensuring data from other sub-sectors is regularly updated in the EMIS Data Warehouse. However the manner in which this information is obtained will vary depending on whether all institutions in the sub-sector fall under jurisdiction of the Department of Education and secondly whether the institutions are directly managed by the State Department of Education.

Table 2. Sub-sectors on which EMIS should store information include

<table>
<thead>
<tr>
<th>Sub Sector</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten</td>
<td>All institutions fall under the jurisdiction of the State Department of Education although not all will be managed and funded by the government.</td>
</tr>
<tr>
<td>Primary</td>
<td>All institutions fall under the jurisdiction of the State Department of Education although not all will be managed and funded by the government.</td>
</tr>
<tr>
<td>Secondary</td>
<td>All institutions fall under the jurisdiction of the State Department of Education although not all will be managed and funded by the government.</td>
</tr>
<tr>
<td>Vocational and Technical education</td>
<td>Only some institutions fall under the jurisdiction of the State Department of Education and institutions may or may not be managed and funded by the government.</td>
</tr>
<tr>
<td>Higher Education</td>
<td>Only some institutions fall under the jurisdiction of the State Department of Education and institutions may or may not be managed and funded by the government.</td>
</tr>
</tbody>
</table>
3.9.2 Institutions under the Jurisdiction of the State Department of Education

In most cases the following learning institutions and centres will fall under the State Department of Education:

a) Kindergarten to Upper Secondary Schools
b) Higher Education Institutions including Universities and some Poly-techniques and Tertiary Vocational Education Centres.

In some cases non-formal education centres such as Adult education and literacy centres will also fall under the jurisdiction of the Department of Education.

These institutions fall into two categories:

1) Those institutions that are managed directly under the State Department of Education which generally includes all government funded or partially funded institutions.
2) Those institutions that fall under the jurisdiction of the State Department of Education but are not directly managed and / or funded by the government.

3.9.2.1 Directly funded and managed institutions under the jurisdiction of the State Department of Education

For those institutions which are directly funded there will be different degrees to which the government determines and manages the release of resources such as facilities, teachers / lecturers and other benefits. Some institutions, such a government universities, are likely to have a much higher level of fiscal and operational autonomy than a government primary school. Therefore different levels of information will likely be required on the different types of institutions, enrolments and other factors.

All staffs funded under the State Department of Education should be present and their position and institution identified through the HRIS. Some Departments of Education will require non-government teachers to also be registered through the HRIS. This is a good way to help ensure standards of teaching are maintained throughout the education system as well as providing a central registry of all teachers registered to teach in the state.

In almost all cases the Ministry of Education will require detailed information on enrolments in all government funded institutions. The Kindergarten to Upper Secondary education sub-sectors have standard subjects taught and require similar facilities to operate. There are fixed school standards to which all schools should aspire/adhere to. These are understood and mandated in State and National government policy. Allocation of limited resources to Kindergartens, primary and secondary schools is usually determined by the State Department of Education at the Block, District and State level and therefore the State Department of Education requires information for full planning and resource allocation is required. Hence, standard information can be collected on all institutions pertaining to facilities, teachers, assessment results and other information discussed in this guide.
Higher Education Institutions and Vocational Education Centres will often have relative autonomy when procuring facilities and materials required for teaching within budget constraints imposed by the State Department of Education. Further, the range of facilities and equipment required in higher education institutions is much greater and supply is difficult to determine when using top down planning (from the State Department of Education). Therefore in these cases, the State Department of Education requires information on finances, enrolments by course, and staffs. In addition, most higher education institutions will have access to the internet and have the capacity to interact with online Education Management Information Systems. Therefore State Departments of Education should operate uniform online education information systems whereby universities can register individual students, courses and log courses to students. Student achievement can be recorded for individual pupils. This system can assist the higher education institutions to manage students and courses, provide an online registry of all higher education pupils and their academic records, and can assist State Departments of Education to identify education development needs.

3.9.2.2 Non-Government funded and managed institutions under the jurisdiction of the State Department of Education

For those institutions which fall under the jurisdiction of the State Departments of Education but which are not managed and funded directly by the State Department of Education information will still be required in order to properly assess the education sector. For these institutions the State Department of Education will still require information but likely not as much information as on government institutions. Information will therefore be required for two purposes:

a) To ensure that institutions are meeting minimum government standards in the provision of education concerning teachers, facilities, health, security and other aspects.

b) To help gain a complete picture of the education sector to enable proper planning, monitoring and evaluation of the sector.

It is advisable to develop minimum information requirements from non-government institutions and then to enforce annual compliance with those recommendations. U-DISE provides this for the basic and upper secondary education sub-sectors and ensures that all institutions whether government or non-government provide a minimum level of information annually. Similar forms should be developed for higher education institutions and vocational and technical learning centres. If a student tracking system is developed for government higher education and vocational institutions then it is advisable to also ensure that non-government institutions use the same system to ensure all students are recorded and tracked through the government system.

3.9.3 Those institutions not under the jurisdiction of the State Department of Education

There will be some institutions that are managed under other Departments. For example vocational institutions which are managed and funded under the Department of Tourism or the Department of Training and Technical Education. The extent to which this is the case will vary State to State. In such circumstances the State Department of Education should work with other State Departments to ensure that minimum data standards are agreed and enforced for the capture of education data for all institutions. If possible other State Departments should encourage institutions to adapt the State Department of Education EMIS systems to record pupil enrolments and other details directly in the EMIS. If this is not possible then information on other institutions should be captured at least annually in accordance with agreed data standards. A good method for agreeing on data standards is to host a workshop with other State Departments to agree on standards and information uniformity and
system sharing. The processes detailed in these guidelines (refer section 4) can then be employed to guide all institutions to fall under the State Department of Education systems.

3.10 Difficult to Capture EMIS Data

There are several areas on which State Departments should have accurate and timely data available through the EMIS Data Warehouse. This includes Literacy and Non Formal Education. Both literacy training and Non-Formal Education are often organised outside the established formal system, whether operating separately or as an important feature of some broader activity. Therefore data on these forms of education are best captured through survey rather than census. Thus a sample selection of the population can be selected and interviewed as to their level of literacy and involvement in non-formal education.
4. EMIS Implementation Process

**Goal:** This section gives an overview of the process of developing or strengthening state Department of Education EMIS.

Developing an EMIS takes time and extensive stakeholder consultation. Failure to undertake development in stages can result in user dissatisfaction which can result in a failed implementation. Following a structured approach to development will help minimise the risks of failure and help ensure a successful implementation.

### 4.1 Overview of the EMIS Strengthening and Development Process

As indicated in the process below, several steps in the EMIS strengthening process must be completed before actually starting to develop the EMIS, including forming a Stakeholder Leadership Group (SLG), conducting an EMIS assessment and improving existing systems, infrastructure and data collection procedures. It may seem like these steps will take a lot of time, but experience in other countries and states of India indicates that they are essential in ensuring that the EMIS strengthening activity is successful and can be sustained over the long term. The initial planning steps will make certain that the EMIS developed actually meets the needs of stakeholders saves costs and time when software development gets underway.

EMIS strengthening activities and this guide are primarily aimed at state-level ministries of education and similar bodies with the aim of improving the EMIS for the state’s education workforce. Other groups that will benefit from applying these methods include: private or nongovernmental organizations managing education workers in the country; districts adopting an EMIS to plan, monitor, evaluate and budget for the education sector; professional licensing or certification associations tracking a cadre of qualified education workers such as teacher training centres; or large education institutions seeking to better manage employees. Some recommendations such as integration with the national census system U-DISE, are specific to state Departments of Education, however many recommendations can be applied to other education stakeholders and even other sectors besides Education.

### 4.2 Implementing the EMIS Process

The EMIS development and strengthening process comprises five key stages using a participatory approach (see Figure below). The participatory approach involves stakeholders in EMIS information from various ministries or departments and key stakeholder groups representing education groups from the outset and increases local ownership of the system.
**Step 1: Strengthen legal and organisational environment.** Establish a Stakeholder Leadership Group (SLG) and identify key policy and management questions. Strengthen the capacity of the EMIS unit to develop and manage EMIS. Strengthen the policy and Legislative Environment.

**Step 2: Define Key Policy Questions, Issues and Functions.** Identify all requirements from existing policy and planning documents. A key output at this stage is the software requirements document.

**Step 3: Assessing and Improving Existing Systems and Developing the Implementation Plan** Conduct an assessment of existing EMIS and other education information systems, current information and communication technology infrastructure (e.g., existing networks, Internet connectivity and software) and data already being collected by different ministries, councils and other organizations. Identify gaps that should be addressed by an improved EMIS while making rapid improvements as feasible. This should be used to develop an Implementation Plan.

**Step 4: Implementing the EMIS.** After the SLG agrees on key education workforce questions and necessary system improvements, customize EMIS software solutions to meet identified needs. The agreed-upon solution could either be a step solution or a mature system, but it should incorporate existing systems, tools and processes as much as possible to lower costs and speed up implementation.

**Step 5: Use Data to Make Decisions and Ensure Sustainability.** Once the improved EMIS begins producing reports of Education information, pay attention to how data are actually used for decision-making. Provide training and support to managers and decision-makers in their efforts to effectively...
use and analyse the data that the EMIS provides. Throughout the process, emphasize sustainability and continuous improvement of the EMIS through training and building capacity to support, use and improve the system into the future.
5. **Step 1: Establishing the Organisational and Policy Framework to support Implementation of EMIS**

**Goal:** Establish the organisational and legal and policy framework to guide EMIS strengthening activities.

A state-level participatory approach to strengthening EMIS is advocated, the foundation of which is a leadership body composed of stakeholders in the system. This includes establishing a Stakeholder Leadership Group (SLG), strengthening the legal framework and methods of strengthening. The materials in this section provide a guide to strengthen the organisation and legislative environment to support EMIS.

5.1 **Developing a Data Sharing Policy or Agreement**

5.1.1 **The Importance of Sharing EMIS Data**

Implementing an EMIS will make the sharing of data concerning staffs far easier. To share data a database simply has to be copied or a file exported in a format that can be understood by the recipient. Data-sharing is an important way to increase the ability of researchers, scientists and policy-makers to analyse and translate data into meaningful reports and knowledge. Sharing data discourages duplication of effort in data collection and encourages diverse thinking, as others are able to use the data to answer questions that the initial data collectors may not have considered. Sharing data also encourages accountability and transparency, enabling researchers to validate one another’s findings. Finally, data from multiple sources can often be combined to allow for comparisons that cross national and departmental lines.

5.1.2 **The Importance of a Data-Sharing Agreement of Policy**

A data-sharing agreement or policy is a formal contract or document that clearly documents what data are being shared and how the data can be used. Such an agreement serves two purposes. First, it protects the State Department of Education EMIS unit or equivalent body, providing the data, ensuring that the data will not be misused. Second, it prevents miscommunication on the part of the provider of the data and the agency receiving the data by making certain that any questions about data use are discussed. It also informs relevant stakeholders of what type of data can be made available. For example it is common to provide detailed information on numbers of students in schools by gender and qualification, however individual personal data is often kept confidential from individuals not part of the Department of Planning, those responsible for Examinations, Scholarships or disadvantaged allowances or similar functions.

It is important to recognize that the process for setting up data-sharing agreements varies from state to state as well as the type of data that is being shared. Some states will already have State Level policies or be guided by national information policies which dictate the sharing of EMIS data whilst others may have similar agreements in other ministries.

5.1.3 **What Should Be Addressed in a Data-Sharing Agreement?**

Following is a list of items that are typically found in a data-sharing agreement or policy. Although this list may cover the basics, additional concerns may be relevant to a particular dataset or provider agency. Ideally, these added concerns should be addressed in the data-sharing agreement to facilitate clear communication and, if needed, establish additional safeguards:
1. **Data Coverage**: Define which data is covered and which is not covered under the agreement. Typically data on individual schools, enrolments and facilities is publically available while data on individual pupils and teachers will be restricted to aggregate numbers or data without identifiable elements such as name or payroll id number.

2. **Period of agreement**: Clearly define when the provider will give the data to the receiver and how long the receiver will be able to use the data. Once the receiver agency no longer has the right to use the data, what will happen? Will the data be returned to the provider or will it be destroyed (deleted from hard drives, shredded, burned, etc.)?

3. **Intended use of the data**: State as specifically as possible how the receiver may use the data. What studies will be performed, what questions will be asked and what are the expected outcomes? Can the receiver use the data to explore additional research questions without the approval or consent of the provider?

4. **Constraints on use of the data**: List any restrictions on how the data or data findings can be used. Is the receiver required to document how the data are used? Can the receiver share, publish or disseminate data findings and reports without the approval or review of the provider? If the receiver generates a report based on the data, does the report belong to the receiver or the provider? Can the receiver share, sell or distribute data findings or any part of the database to another agency?

5. **Data confidentiality**: Describe the required processes that the receiver must use to ensure that data remain confidential. Because EMIS data contain information that can be linked to individuals, it is important to put safeguards in place to ensure that sensitive information (e.g., salaries, exam results) remains private. Personal data should remain confidential and should not be disclosed verbally or in writing to an unauthorized third party, by accident or otherwise. Will the receiver report information that identifies individuals? What safeguards are in place to prevent sensitive information from becoming public?

6. **Data security**: Describe the methods that the receiver must use to maintain data security. Hard copies of data should be kept in a locked cabinet or room and electronic copies of data should be password protected or kept on a secure disk. Will everyone at the receiver agency have the same level of access to data, or will some people have restricted access? What kind of password protections need to be put in place? Who will have physical access to the data, including the servers and the paper files? What will happen to the data after the data-sharing period ends?

7. **Methods of data-sharing**: Identify the way in which data will be transferred from the provider to the receiver. Will data be transferred physically or electronically? If data are to be sent over the Internet, how can a secure connection be guaranteed? Will the data be encrypted before being transferred?

8. **Financial costs of data-sharing**: Clarify who will cover the monetary costs of sharing the data. Will there be expenses related to sharing the data? Will the provider or the receiver share the costs, or will one agency pay for all data-sharing expenses?

### 5.2 Establishing or Strengthening EMIS Leadership

#### 5.2.1 Establishing the Stakeholder Leadership Group for the implementation of EMIS

When establishing a system as important as an EMIS, it is good practice to establish a steering committee or leadership group. The Stakeholder Leadership Group (SLG) is a formal group of representatives from all stakeholders that produce and use Education for education. Establishing this group is an essential first step when implementing an EMIS. This group will initiate, lead and monitor all activities in EMIS strengthening and ensure proper representation of all key stakeholders.

The SLG empowers stakeholders to envision and develop an EMIS that meets their needs. The SLG ensures ownership of the system by those who will use it and builds the necessary capacity to support...
and improve the EMIS. Furthermore, bringing together the key stakeholders opens communication channels between groups that typically may not interact, facilitating collaboration and sharing of data.

### 5.2.2 Who Are the Stakeholders?

A participatory and inclusive approach is the key to the SLG’s success. An effort should be made to identify and invite representatives from all government and nongovernment groups that produce and use Education data to join the SLG.

Think broadly when considering whom to invite as stakeholders. Ask:

- Who provides EMIS information?
- Who uses EMIS information?
- Who are the Planning, Policy, Evaluation and Budgeting decision-makers?

Ministry departments (especially planning, information technology and sub-sector education departments), licensing and registration/certification bodies, private-sector organizations, private schools and non-formal education facilities, scholarship boards and training institutions may all be stakeholders. Ideally, the SLG should include experts in education workforce planning and information systems. Depending on the scope of EMIS development, school principals and teaching staff may be invited to ensure that individual-level data remain accurate and that they have access to necessary information. Community leaders and volunteers may also be stakeholders in certain contexts.

Care should be taken not to create a group that is too large in size, as large groups tend to be less effective. It is best to invite one or, at most, two representatives from each stakeholder to join the SLG.

### 5.2.3 The Role of the SLG

The SLG’s role is a steering or coordination group whose task is to lead, coordinate and provide oversight for all EMIS strengthening activities. In this role, the SLG manages the following activities:

1. Establish consensus on the mission and purpose of the SLG
2. Agree on operating principles and terms of reference for organizing the SLG
3. Develop policy and management questions to inform data needs and EMIS functions
4. Define indicators to monitor the status of the Education System via the EMIS
5. Identify existing systems, including infrastructure, databases, forms and collection mechanisms at all levels
6. Prioritize requirements for the EMIS
7. Select an appropriate EMIS software’s or development strategies to meet immediate needs
8. Determine timelines and meetings for EMIS strengthening activities
9. Address issues pertaining to data confidentiality, privacy and ownership and policies for data-sharing
10. Establish data-sharing agreements with partners, collaborators and one another
11. Share findings and tools with other ministries, sectors, countries and regions.

In order to help achieve this, the SLG may wish to appoint an operational taskforce of full time staffs to achieve the desired outcomes.

### 5.2.4 Getting Started

The initial meeting should include representatives from as many identified stakeholders as possible, explain the need for and benefits of a strengthened EMIS and provide a general overview of the EMIS strengthening process (refer below). Sample terms of reference are included in the section below.
The SLG should meet on a regular basis to provide direction for EMIS strengthening activities: infrastructure strengthening, data collection and inputting, EMIS selection and customization, report development, use of data for decision-making, data-sharing and confidentiality policies and continued maintenance and development of the system. This document contains information to assist in each of these processes.

The initial assessment stages of EMIS strengthening will help the SLG to identify gaps and begin forming an overall strategic plan for strengthening the EMIS. This strategic plan can then be refined into iterative active plans, such as three-month, six-month or year-long work plans that proceed step-by-step toward closing the gaps. The SLG’s primary responsibility throughout is to guide and manage the EMIS implementation process. As the process moves forward, the group should regularly evaluate the progress of EMIS strengthening against agreed-upon targets and adjust either the targets or the implementation steps as needed. At every juncture, the most important outcome is that ownership for the EMIS is being built and capacity is being developed among all stakeholders.

5.2.5 Stakeholder Leadership Group Principles of Operation

The Stakeholder Leadership Group (SLG) is comprised of representatives of Education decision-makers, both producers and consumers of EMIS information. Often the formation of an SLG results in new collaborations and therefore requires new definitions of how the group will work together to accomplish common goals.

During the initial meetings of the SLG, the members should decide how the group will operate. The first step is to create a document that outlines the group’s Principles of Operation. This document will define the specific ways in which the group will function and the values that underline the group’s operations. The final record provides a reference for the group and ensures that expectations are clearly defined.

The SLG should consider several questions while discussing the Principles of Operation. Although the following list of questions is not exhaustive, it provides a starting point for the group’s discussion:

a) Logistics
   o Are all necessary groups represented in the SLG, including internal and external groups?
   o What is the group called?
   o When and how often will meetings be held?

b) Group roles
   o Who will facilitate and lead the meetings?
   o Is there a smaller guiding committee of the SLG?
   o Are there critical participants without whom the meetings cannot take place?

c) Decision-making
   o How will decisions be made? By consensus? Majority rule?
   o Is the group comprised of primary and secondary stakeholders, or are all members of the SLG equal?
   o How are agendas decided?
   o How is activity ownership determined? Is activity ownership uniform for each area of EMIS strengthening, or does it vary according to area of focus?

d) Communication
   o How will data be shared? What policies or agreements need to be drafted to address issues of data-sharing?
o What documentation will be produced in these meetings? Who will produce and maintain the documentation? How will the documentation be distributed to members?

o Is there a feedback procedure?

e) Membership rules

o Are others welcome to attend or join SLG meetings?

o What attendance record is acceptable?

o Are all members expected to contribute to the work?

o Are all members expected to act as resources for one another?

5.2.6 Stakeholder Leadership Group Terms of Reference

After the Principles of Operation have been established, the SLG should determine the Terms of Reference. The Terms of Reference describe the group’s purpose, vision and goals. In addition, the Terms of Reference may clarify the specific activities to be undertaken, which team members are responsible for each activity and when projects should be accomplished.

The final Terms of Reference document should reflect the SLG’s goals and needs. It can be organized into the following format:

- Background
  
o What is the state’s current EMIS system? (Describe)

  o Why was the SLG formed?

- Purpose
  
o What is the overall mission and vision of the SLG? (Example: To create a central source of EMIS data and to help deploy resources in schools more effectively)

  o What are some of the SLG’s specific goals and how do these goals relate to the group’s larger mission? (Example: To link data from existing systems, to ensure stakeholder access to data)

  o What are the major obstacles to accomplishing these goals? How will these obstacles be addressed?

  o Does the SLG have any other specific duties?

- Structure and composition
  
o To whom is the SLG accountable?

  o Who is the chairperson of the group? Who is the secretary? Are there any other roles that need to be established?

  o Are there any smaller working groups within the SLG? Who are their members? What are their functions?

- Operations
  
o What is the group’s scope?

  o What does the group intend to accomplish? What is the timeline?

  o What are the expected functions of the group?

- Policies
  
o Who will own the group’s outputs (e.g., the EMIS)? Who will have access to it?

  o Can these outputs be used for commercial purposes?

Collaboratively, the SLG can decide how detailed the Terms of Reference should be. In some cases, it may be helpful to craft the document as a general overview of the group’s purpose and functions. In
other cases, it may be beneficial to develop the document more fully to include objectives, scope of work and deliverables.

Once the Principles of Operation and the Terms of Reference have been drafted, they should be shared with the members of the SLG and approved by the State Minister of Education and maintained as reference documents. These documents provide a record of the expected roles, expectations and goals of SLG members and should guide the subsequent work of the group.

5.3 Establishing or Strengthening an EMIS unit and its role in development

Some State Departments of Education do not yet have a dedicated Education Unit for managing education data. EMIS implementation is best undertaken by a dedicated team responsible for all EMIS and MIS matters and who can be targeted for training at both the state and sub-state (district and block) levels.

The EMIS unit should coordinate and be focal to all aspects of development. The EMIS Unit should be focussed on ensuring that:

a) All the requirements of EMIS are accommodated through the EMIS unit
b) The EMIS is developed to a high level of quality and uniformity in standards.
c) Key stakeholders are properly engaged throughout the process.
d) Data in the system is complete and of a high level of quality
e) That all reforms to processes are properly implemented.

Most user testing of the system should be undertaken by the EMIS unit however the EMIS unit does not necessarily require technical skills. The requirement for technical skills will depend on the method of implementing information technology solutions being implemented by the state or department of Education. This varies state to state and is discussed below.

5.4 Preparing the Unit or Department Responsible for Ensuring Technical Quality and Hosting

The other key group which must be consulted at all phases is the group responsible for the technical quality of the application and its eventual hosting. This will vary state to state as different states have different arrangements for the hosting of information technology solutions. Generally there are three options which are detailed below:

a) The state has a department responsible for all e-government solutions (refer section 4.3.1 below concerning recommended methodology of deployment) such as the Nodal State IT Agencies or state units of the National Informatics Centre (NIC). For more information on the NIC refer to Annex 5.
b) The Department of Education has a unit responsible for education information systems which also may manage the quality of EMIS development and host the system.
c) The Department of Education and/or all state departments outsources technical responsibility for software application quality and hosting to a service provider.

The ideal solution is that the state has a department responsible for all ICT solutions and for ICT standards. This department can ensure that all government ICT solutions adhere to proper and uniform technical standards and that all e-government solutions are properly hosted. For states that do not yet have a state wide ICT department such as the NIC, there is often a unit within the Department of Education that is responsible for ICT implementations for the entire department. This is the unit that is normally responsible for state EMIS systems and for national standards such as U-
DISE (refer section 3.5). In some states, a service provider may undertake this role. This can work provided the service provider works closely with the government and does not restrict access to information or systems. It is important that the government fully own all systems, data, and, in cases where the application is not procured as an end solution, source code and that these are not owned or restricted by an external agent.

The technical quality and hosting agent will be responsible for ensuring that:

a) Data standards are properly adhered to.

b) Best practice for ICT development and implementation is employed including database model, user interfaces and reporting.

c) The application properly accessible to required stakeholders.

It is important that the technical unit or department be consulted at each step of the implementation process to ensure input into technical standards and quality.
6. Step 2: Define Key Policy Questions, Issues and Function and Develop the Software Requirements

**Goal:** To assist state departments of education to draft an EMIS requirements document. The requirements document should clearly state the main functions of an EMIS and the data that is required to populate an EMIS and how it can be captured and reported.

### 6.1 Overview of an EMIS Requirements Document

An EMIS should be responsive to the planning, monitoring, evaluation and efficiency needs of a state department of education. Before implementing an EMIS it should be clearly understood:

- **Users:** Who requires education information?
- **Purpose:** What goal will be accomplished with the information?
- **Frequency:** How often is the information required (i.e., daily, weekly, monthly or annually)?
- **Output Formats:** How the information should be presented (as a chart, graph, tabular report, spreadsheet, etc.)

A document detailing the requirements of an EMIS will help departments of education to respond to each of these questions and to ensure that this information is all captured in a single document. The EMIS requirements document can form the basis for implementation and deployment of the EMIS. It is essential that this document be thorough and respond to all issues raised in this section. Such a document can be reviewed annually to ensure that all requirements for the EMIS are being met and to help determine any changes required to the system. General information concerning a software requirements specification can be found online from many sources including:

- [http://www.microtoolsinc.com/Howsrs](http://www.microtoolsinc.com/Howsrs)

There are ISO9001 standards for a software requirements document which can also be followed which can be sourced through ISO9001 compliance forms. More information can be found at the following link:


If the state prefers to adhere to National Standards & Guidelines for ICT deployment it is likely that they will already have developed standards for a software requirements document. If a template is not available then there are many available online such as the following which can be easily adapted as a standard for a state Department of Education:

- [www.tricity.wsu.edu/~mckinnon/cpts322/cpts322-srs-v1.doc](www.tricity.wsu.edu/~mckinnon/cpts322/cpts322-srs-v1.doc)
- [www.uccs.edu/Documents/tboultsrs.doc](www.uccs.edu/Documents/tboultsrs.doc)

This section is therefore concerned with the specific considerations for an education EMIS that should be included in such a document.

### 6.2 Developing Education Policy and Management Questions and Indicators

Education policy and management questions are, very simply, questions about the education system that need to be answered. Such questions often form the top level of requirements that an EMIS must
respond to. Think of questions that are often asked but cannot be answered because the needed information is not available, current or complete. Once data are input into an Education information system (EMIS), they can be aggregated, reported and analysed to provide answers to most Education policy and management questions.

6.2.1 Policy and Management Question and Indicator Development

Why develop questions before the data are collected? This is because the process of defining the questions broadly determines what data need to be collected and what reports need to be run on that data to produce the answers. When the EMIS is designed to address the most pressing Education policy questions, it is better able to address specific education planning needs and staff members spend less time collecting unnecessary information. Developing questions also helps you to identify the areas of policy and planning for which the EMIS will assist you to respond.

One of the first activities of the Stakeholder Leadership Group (SLG) is to agree on a prioritized list of policy and management questions (refer section 6.2 above). The following process can be adopted to develop education policy questions that can be responded to through an EMIS:

1. Brainstorm education policy and management questions using the examples below as a guide. Brainstorming can happen in the larger group or in small groups that then compile questions with the larger group.

2. Combine duplicate questions and identify categories for drilling down into more detail or disaggregating the data. For example, "How does the net enrolment rate break down by gender and are all marginalised groups participating in education?" and "Are subsidies to marginalised groups impacting enrolment and attendance" are the same question disaggregated, or displayed, in two different ways. These two questions can be combined as: "What is the relative participation by gender and ethnicity for those pupils receiving and not receiving subsidies?"

3. Evaluate whether current data and systems can answer these questions. (This task may be completed by the EMIS development team or a consultant as part of the EMIS assessment process.) Assess:
   - Which questions can be answered now with the existing systems?
   - Which questions require additional data collection?
   - Which questions require linking with data in other systems?

4. Based on this feedback, prioritize the questions as follows:
   - Immediate need
   - Expected of the next round of system development
   - Save for a future version.

These prioritized features are the driving force behind what a state department of education EMIS needs to be. The list of questions should be periodically revisited to determine whether new questions should be included or old questions are no longer a priority. The EMIS should adapt to user needs—not the other way around. This process should be undertaken as part of an annual review on the EMIS.

5. Share the final list of questions with the full SLG. The features identified as the highest priority should be used to select an appropriate EMIS solution and determine what customizations need to be made to the system.

6.2.2 Question Examples

The following are a short list of examples of education policy and management questions which can be used as a starting point for brainstorming. These are examples only and should not limit you in the
scope or number of questions you identify. All questions should be considered during the initial brainstorming, although some may prove to be outside the bounds of an EMIS. The final list of questions should represent the Education policy and management issues that are most important to your state.

- Where our education resources are over deployed and under deployed? Which communities are serviced and underserviced for each type of education?
- Which schools are under resourced and which are over-resourced? How does this impact learning and what can we do about it? Are all children learning and accessing education equally? If not how can we ensure equality?
- Are all education institutions conforming to minimum national standards?
- Are children progressing through the education system in the minimum time? Are certain children repeating, dropping out?
- Do children with disabilities have access to education? Are facilities suitable for children with disabilities at all schools?
- Where are teachers deployed and how much does it matter?
- How old are the teachers and how can we plan for staffing needs?
- What are secondary students choosing to study where they can and can they not access education?
- Does upper secondary vocational education and training improve the prospects of young adults and how can it be incorporated into secondary education?
- How do early childhood education and care policies, systems and quality vary across regions?
- How does class size vary throughout the State and how does this impact learning?
- How can support to education help tackle rising income inequality?

As you can see, the list of questions is almost endless however it pays to take time to ask the questions and list them and then identify the questions you cannot answer. For those questions you cannot answer you should investigate whether a good EMIS can help you respond to those questions.

6.3 Ensuring Education Policies and Plans can be Facilitated and Monitored through the EMIS

In addition to responding to questions concerning data and the education system, the main uses of EMIS and the design of information capture and processing should be based upon the requirements of education policies and plans. Ideally such policies and plans will be in place prior to the implementation of the EMIS. The EMIS will then have to be annually reviewed to ensure it remains compliant with and responsive to changes in education policies and plans. The EMIS must be able to respond to the needs of each of these key policy initiatives.

The existence and nature of education policies and plans will vary in each state of India. The absence of clear education policies in an area should not prohibit the implementation of an EMIS. A good EMIS will be based on best practice of managing Education and can be adapted to changing policy needs. An examples of good EMIS implemented in India are presented in section 10 of this document.

6.4 EMIS Data

6.4.1 Data Required for an EMIS

The processes and functions of an EMIS required for a Ministry or Department of Education to function result in certain data requirements. In most cases, most data will be derived from U-DISE and similar annual data collection exercises. Different types of EMIS data are discussed in section 3 of these guidelines.
6.4.2 EMIS Data Standards

6.4.2.1 Overview of Data Standards

"Standards are documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics to ensure that materials, products, processes, and services are fit for their purpose." (ISO 2008). In order to share, exchange, and understand data, we must standardize the format as well as the meaning. Standards are rules establishing how data are described and recorded in a consistent format. Using standards makes data more usable to more than just the project or person that created the data.

Standards are also necessary when integrating data from multiple resources such as between EMIS and U-DISE or EMIS and other state information systems (e.g. Treasury and infrastructure databases). If the various sources agreed upon a standard to begin with, this saves time reconciling any differences. Data standards can also help relate paper or hardcopy records to information retained in the EMIS.

6.4.2.2 Unique Identifiers

With reference to a given (possibly implicit) set of objects, a unique identifier (UID) is any identifier which is guaranteed to be unique among all identifiers used for those objects and for a specific purpose. For example, each school within a state should be referenced by a unique code. There are two criteria that are desirable in a unique identifier.

1. It must be permanent and not subject to change at any time.
2. It must be unique for that item.

The code used for identifying teachers and institutions within a database is very important to the operation of a good EMIS. As noted in section 3.5, the national data standard for education data is the U-DISE data collection form and U-DISE software database. However U-DISE has some shortcomings. Codes used to identify institutions and teachers are not enforced consistently each year and thus they are not permanent. The codes are linked to geographic location such as block and district and therefore if the boundary changes the code will change. This is against one of our two required qualities of a unique identifier, that it be permanent. Further, the coding system used for teachers does not match that used in most states and is thus not uniform for all information capture within the state. In U-DISE, teachers are referenced with the school U-DISE code and an incremental number. Thus codes between state payroll systems and U-DISE for teachers do not match and the data cannot easily be compared.

In most cases the state will already have a unique code for all staffs employed through the state government. This is typically a payroll or social security number or similar state identification number used for tracking of citizens, permanent residents, and temporary residents for the purposes of work, taxation, government benefits, health care, and other governance-related functions. The department of education should use the same number to identify all staff so that data between other government departments and the department of education can be compared. This will also ensure that if systems are later merged it will be a much simpler task than if the data sets were using different coding systems.

---

7 https://en.wikipedia.org/wiki/Unique_identifier
All institutions should be coded with a unique code. In some states this is a facility or asset code, in other states it is an Education Management Information System (EMIS) code or U-DISE code. If you are using a U-DISE code for an institution it should be ensured that it is both permanent and unique. Once assigned the code should not change and should be recognised on all documentation and systems throughout the department of education.

All blocks, districts and states should also have unique codes to help identify them. If a student information system is going to be implemented then all students should have unique identification codes.

**Example:** A state Education Department decides to create a new code for all schools. It is decided that the code should be comprised of the following:

<State code> + <District Code> + <Block Code> + <a code for Level of School> + <An incremental code for the school>.

The state declares that the code may change if the district boundary changes or the school is upgraded.

**Is this Correct or Incorrect?**

**Answer:** This is incorrect as it violates our first law of unique identifiers which states that the code should be permanent. If the education department allocated a code to a school using the above formula and then declared it permanent then it would adhere to our first law. However as the state education department declared that the code may change then it is not a suitable unique identifier.

### 6.4.3 Other Data Standards

Other data standards are usually established and agreed during the process of design and implementation of the EMIS. These include standard terms and definitions which can be given to all data terms. Data standards for all data items are employed to ensure that data can be quantitatively assessed.

Data standards, once agreed, should be used in all systems and correspondence throughout the department of education. It is therefore important to clearly define all data standards used by a department of education, not just for an EMIS, but for all information to be communicated in any system or paper format. This will ensure that the same terms mean the same thing to different people and will also ensure that data can be quantitatively analysed through information systems such as EMIS.
7. Step 3: Assessing and Improving Existing Systems and Developing the Implementation Plan

**Goal:** Understand how to identify, assess and improve existing systems and processes that support the EMIS and develop the final implementation plan.

Once the requirements of the system have been determined it is possible to determine what must be achieved during the EMIS implementation. To do this it is necessary to identify which systems and infrastructure are in place to support the EMIS, how they will eventually interact with the EMIS, and which must be changed in order to achieve the final requirements. The final document in this process is an EMIS Implementation Plan.

Before the implementation plan can be developed, it is necessary to conduct an assessment of existing EMIS, such as paper based, and other education management information systems such as U-DISE, identify current information and communication technology infrastructure (e.g., existing networks, Internet connectivity and software) and data already being collected by different departments, councils and other education organizations. This will help to identify gaps that should be addressed by an improved EMIS while making rapid improvements as feasible. The implementation plan can then be developed with a complete understanding of what has to be achieved in order to implement the EMIS.

In many ways this is the most important step in the process of developing an EMIS. Investing time into ensuring a good and implementation plan and ensuring that the solution will meet all user requirements in the most cost effective manner is critical to ensure success during implementation and to ensure sustainability thereafter.

7.1 What is an Implementation Plan

An implementation plan is a complete overview of the EMIS development. The Implementation Plan describes how the information system will be deployed, installed and transitioned into an operational system. The plan contains an overview of the system, a brief description of the major tasks involved in the implementation, the overall resources needed to support the implementation effort (such as hardware, software, facilities, materials, and personnel), and any site-specific implementation requirements. It should also specify the training and support requirements and the increases (if any) or decreases to recurring costs that will eventuate from implementation of the system.

The plan is developed during the Design Phase and is updated during the Development Phase; the final version is provided in the Integration and Test Phase and is used for guidance during the Implementation Phase. The implementation plan is time bound and the budget should be clearly specified for each item. The implementation plan should also specify any changes to roles and responsibilities of staff that may result from implementation of the EMIS.

The exact nature of a software implementation plan is subject to some debate. Some sources will specify that a software design document should first be developed. Other sources will specify that the design document and implementation plan should be a single document. These guidelines recommend a single document to help show what has to be accomplished and how it will be accomplished in a single document.

Software Implementation plan templates can be located on the internet. Links to some examples are listed below:
These links provide general templates which encourage you to consider all aspects required in an implementation plan.

7.2 Assess the Present Systems used for Education Management

This section gives general information as to how to assess the present education information systems and plan for implementation of the EMIS.

The SLG should commission an assessment of the systems that are already in place for supporting a strengthened EMIS. This comprehensive assessment should consider not only any existing electronic information systems, but also paper-based systems, data collection forms and processes for gathering data about the education system. In addition, the information and communications technology (ICT) infrastructure needed to support a software-based EMIS should be considered.

The assessment provides a complete picture of how Education information is currently collected, managed and reported; the tools and processes that are in place for managing Education data; and the gaps that need to be addressed to meet the most pressing needs. Often the results are surprising. During the assessment phase, the SLG may discover underused sources of Education information managed by different departments or associated education organizations such as Non-Government Organisations (NGO) that can be linked together to immediately improve education data access for all.

Following the assessment, the SLG typically can recommend rapid improvements to ICT infrastructure to appropriately bring networks, Internet connectivity, hardware, software and even electrical supply up to standards that can support an EMIS. These improvements can generally be implemented quickly and often result in increased efficiency and productivity. In addition to improving the ICT infrastructure, recommendations for improving data collection, training procedures and technical support should be made at this point in the process. Data quality is of primary importance and should be emphasized at every step of the process, from initial data collection to data analysis and interpretation.

7.3 Planning for Deployment of the EMIS

7.3.1 Determining Deployment Modalities for the EMIS

In order to successfully deploy an information technology solution, it is necessary to have the proper information technology infrastructure in place and to determine the deployment modality of the EMIS. In environments with poor access to computers and internet, deployment of EMIS solutions may be prohibitive and alternative solutions for the short to medium term may have to be considered. This section gives an overview of hardware and internet issues which will influence deployment.

The EMIS should be available at Block, District and State levels, in order to support the relevant decision making at these levels. Ideally it should also be accessible to actors at the institution level such as for head teachers and teachers in schools. The best and most sophisticated Education Information Systems are accessible by students and parents however it is understood that in many states of India the development index will prohibit such levels of access.
MIS applications in general, and EMIS specifically, are increasingly being deployed via the internet. The internet offers many advantages for the deployment of EMIS over traditional client server deployments. These include:

- Reduced deployment costs through management of a single server environment as opposed to a distributed client server environment
- Reduced operational costs as training and support can be delivered via the internet.
- Individual employees can access the EMIS to verify or update data within constraints and can directly manage data for which they are directly responsible.
- Improved security owing to having to secure a single central data store rather than a distributed data store.
- Easier capacity to make uniform changes to the system as required and greatly simplified data management.

Typically a good EMIS deployment will be defined by the following characteristics:

- The software is located on a central computer, or server, that multiple users can access concurrently and that can be kept secure and backed up. Concurrency and Redundancy are key highlights of such an implementation
- The data are stored in a centrally located database, which enables easier updates, searching and analysis of collected education information
- A Web browser is the principal tool for interacting with the EMIS, so that the system is immediately available to anyone with an Internet or network connection and authorized access, reducing deployment time and training requirements.
- The system can easily be customized to fulfill the specific needs of the context in which it will be used
- The system can be scaled to adapt to expanded coverage or for use by more organizations such as private or non-formal schools.
- Additional modules can be programmed for the system to meet changing and expanding needs.

However, Education departments need to recognize some of the current limitations of web technology and its integration to the EMIS backbone. These include:

- Security of private student and staff information is a top priority. Ministries of Education looking seriously into internet enabling of their data should evaluate the authentication, security, access rules, and audit trails related to service providers' networks, servers, and applications (Karakanian, 2000).
- User satisfaction can also be an issue and is often suggested as an indicator of IS success (Shibly, 2011). If the internet is too slow or inaccessible then administrators, head teachers, teachers and other staffs will experience frustration with the system.
- In regions with poor infrastructure and internet deployment via the internet may be prohibitive.
- Also in a centralized web-based architecture if there are any site specific (school or block level) changes required to be made to the software, the process may become time consuming.

A well-structured and designed implementation plan should deal with these risks. For example, in offices which do not presently have internet connectivity information may be completed on forms and submitted to the next administrative office for processing within the EMIS. Given the uptake of internet connectivity (shown below) it is likely that offices without internet will be connected within the next few years. Planning and implementing for this eventuality will save time and effort pursuing inappropriate and outmoded deployment methods. This is also in line with the e-government strategy being undertaken in many states of India in which all government information systems are gradually being deployed via the internet (cloud).
One method of deployment which should now be considered is via mobile devices using 3G/4G. As
the following graph indicate, access to the internet is increasing at a constant rate throughout India,
particularly in urban areas.

Table 3. Growth in access to the internet rural and urban division, India 2012 to 2015

Further, as the following graph attests, access to the internet via mobile devices is increasing at an
exponential rate throughout India and is presently at 252 million people, projected to be approaching
half a billion by 2017.

Table 4. Number of Mobile connections (millions) in India by type 2008 to 2017 (projected)

Therefore deployment via the internet and access to teachers and other staff via mobile devices
should be key technology decisions.

7.3.2 Undertaking an Audit on Hardware and Internet Connectivity

As part of the process of estimating the budget for deployment, it is useful to understand the hardware
and internet connectivity available in each office. Ideally the EMIS should be accessible to everyone
however this may not be possible in areas where infrastructure and internet connectivity are poor.

---

In many cases in developing environments computers are old and faulty and it is simply easier to provision computers to all offices however this decision can only be made after an audit has been undertaken.

Therefore it is recommended that a simple audit of hardware available for operation of the EMIS be undertaken as well as an audit on internet accessibility. A simple form for this purpose is shown in Annex 5 of this document.

### 7.3.3 Determining Hardware and Internet Procurement

There are no fixed rules for determining hardware and internet procurement. The situation will vary in each context. A balance will have to be made between cost of deployment to all offices, schools and individuals, and the availability of budget. It may be cost prohibitive to deploy the system via the internet to offices and schools in remote and rural areas. In this case it is recommended to plan to rollout the EMIS to offices which can access the internet at reasonable cost, and plan for rollout to remote offices in future years when the cost of internet access in those offices becomes affordable.

As noted in the section above, offices which cannot access the EMIS can submit paper forms to the next administrative level for data entry and reporting until such time as they are able to cost effectively access the internet. Experience in other countries indicates that even the most remote and rural offices achieve cost effective internet access through 3G. There are also global initiatives through service providers like Facebook and Google that aim to bring cheap and affordable internet connectivity to remote communities globally.

### 7.3.4 Hardware Maintenance

The cost of hardware maintenance is another factor which must be considered. Hardware maintenance is the cost of updating or replacing computer equipment over time as it either becomes outdated or breaks down. The cost of hardware maintenance is typically factored at 15% of the prices of procurement. This means that 15% of the cost of hardware required for the EMIS should be factored into annual recurrent costs for operation of the EMIS.

### 7.3.5 Servers and other Equipment

Web enabled EMIS solutions will require a server on which to run. Whether a ministry or department of education will be required to procure a server to operate the EMIS is dependent on existing hardware and other factors such as state ICT policies or whether there is a state ICT department or equivalent such as the NIC.

Once data volumes of the system are determined, such as number of records to be captured and processed and general usage, the hosting requirements of the system can be determined. It is strongly recommended to procure local technical advice concerning this. The technical requirement to support a server are high. If a department of education intends to host their own applications they will have to train staff in server management, maintenance and security. This also raises issues of retention. Most ministries that host their own servers also have to contract information technology specialists to maintain and secure the servers and data. Most organisations outsource these functions to specialised service providers who can ensure adequate hardware, bandwidth and security for online applications. NIC (annex 3) are one such government service provider in India and provide this service in states such as Madhya Pradesh.

In most cases it is recommended for Departments of Education to outsource managing the hosting of online applications to external agencies who are competent and experienced in such matters. This will help ensure proper security for data, adequate bandwidth for access to the application and
adequate servers which ensure the rapid processing of data for reports and other outputs. The trend in many states is to host state IT applications within a designated State Data Centre Facility which typically has adequate provisions for maintaining large IT Infrastructure along with skilled resources (typically outsourced).

7.4 Revising Data Collection and Reporting

7.4.1 Overview

An EMIS is data intensive. It is important to understand, prior to an implementation, how and by whom all data is being captured and recorded, so that it can best be determined how that same data will be tracked in the new EMIS, and how data will be converted into the new EMIS from (potentially several) current sources. EMIS value will be optimized when capture of data is planned, and data is transformed into information. This process involves understanding and mapping the existing data collection and reporting process and determining how this can be, if possible, simplified and improved under the new system.

The mapping of all processes and decisions which either produce or use EMIS data is often called a Business Process Overview (BPO). A BPO should be conducted in order to complete the implementation plan for the new EMIS. A BPO involves mapping data sources, procedures and interfaces that take place with respect to EMIS Data. The BPO provides a vision of the future state and acts as a guiding light throughout the implementation, to keep the EMIS Unit focused on the desired outcomes. Undertaking this early in the implementation as a means of involving all stakeholders, promoting the teamwork that will be required for sharing a database, flushing out all high-level requirements, establishing a common vision, and promoting acceptance of change is crucial to the success of the EMIS implementation.

Usually the way in which information within the department of education is managed will change radically with the implementation of a new EMIS. For example, passing of data between the EMIS and other software such as U-DISE may now be possible electronically rather than manually, or redundant data stores may be eliminated causing procedures to change. Data will be automatically compiled and reported rather than manually and this will help change who has access to data and in what formats for decision making.

This process is a holistic review of all the existing reports, metrics and dimensions used in the current EMIS with a mapping to how this data will be delivered in the new system. Often during a reporting rationalization, many reports and metrics are found to be either duplicated in multiple places or unused. By spending time up front to understand the legacy reporting and how it translates to the new reporting needs you can almost always reduce the number of reports that need to be replicated. Building a smaller number of highly utilized reports reduces upfront development costs and also keeps maintenance costs lower moving forward. This activity will also help you to define data capture forms as the data in the system must inform the reporting needs of users.

This activity can be divided into the following stages.
Each stage is described in more detail below. The final product will be clearly defined formats for data collection and reporting and tables describing who should produce data, enter data and receive data and in what format.

### 7.4.2 Data Access and Security

When considering an EMIS solution, take into account data-security needs. A mature EMIS should require a secure login for each user via a username and password. Only the system administrator can establish user accounts. In addition, each user should be assigned a role in the system similar to the ones listed above. The role limits the options that are available to that user when he or she logs in and prevents the user from accessing unauthorized information. Access for all users should be clearly defined and passwords and other security measures should be implemented with regular change intervals. This should be planned in advance at the stage of determining the data that will be collected and reported through the EMIS. A map of users and the data, reports and functions they will have access to should be developed at the end of the process of reviewing data collection and reporting.

### 7.4.3 Mapping processes and decisions using Education data

The first part of the BPO typically involves mapping out all business processes which use EMIS data. Mapping processes involves looking at who presently collects Education data, how and then who requires access to EMIS data. There are various methods for representing this which a skilled software engineer should be familiar with. The mapping of processes should include all processes used to capture EMIS data. This should include the national school census, U-DISE, and related data stores as well as any other systems that deal with EMIS data such as financial data.

As noted this can be a time consuming process but a necessary one in order to properly complete the design of the EMIS. The process can be undertaken by EMIS task force staffs assigned by the SLG and is best facilitated by a trained and experienced software engineer. If you do not have access to a software engineer through the department of education then you can consider contracting one for this role. The process typically take up to two months and will involve a series of stakeholder meetings to review agreed reports and data collection (refer section below). If you are outsourcing development of the systems to a company you can specify this process as one of the set of tasks the company must complete.

It is also useful at this stage to model the flow of data through all departments and to other stakeholders and systems. Diagrams can be used to depict the flow such as data flow diagrams. Data flow diagrams are explained well in the following links:
7.4.4 Catalogue all data capture forms and reports used for EMIS

Once processes using data are mapped, the individual EMIS forms and reports should be catalogued and reviewed. Depending on the availability of documentation this can be a large task. Understanding what data is needed prior to starting the rationalization and developing a strategy to collect it will keep you focused and prevent analysis paralysis. At a minimum, the following information should be logged on each form or report and the sample form or report included in the design document or implementation plan for the EMIS.

- Report or data collection form name and description
- Report or data collection form owner and/or metric owner
- Business area – What part of the organization is the Report or data collection form intended for?
- Report frequency and latency – Is the report run on demand, produced daily, weekly or monthly? Is the data real-time or batch?
- Report type (Operational, Transactional, Analytical) – Often times the legacy system does not distinguish between report types. As organizations move to target architecture, there may be a need to separate reports by future data store.

Aside from including the data collection or report format, each report and data collection form should also be defined. The following are usually defined for each data element.

- Name and definition of each data element as defined on the Report or data collection form
- Data types and length for each data element in the report or data collection form
- If the data is derived from another system then the source database, table and column name for each metric and dimension
- Calculation for each metric. Often times business logic is embedded into a report, so it is critical to capture this logic so that informed consolidation discussions can occur.

7.4.5 Rationalise data capture forms and reports and ensure data standards.

Once this data is collected for each of the legacy reports, a consolidation recommendation can be made. In this step it is important to review all forms and reports and simplify and rationalise where possible and ensure proper data standards are maintained. There will likely be opportunities to eliminate reports or combine reports to meet multiple users’ needs. The rationalization also gives the team a reference point to ensure that the requirements they are delivering on which were defined in step 2 will meet the final reporting needs. Completing a rationalization effort upfront will pay dividends throughout the project and increase the likelihood of having a more simplified EMIS and more satisfied staffs at the end of the project.

7.4.6 Rationalising the flow of data for the EMIS

The final step in the process is to review the overall data capture and reporting system in light of the new EMIS. The objective of the review is to analyse the flow of data through the system. It is important to review who will receive reports and who will be responsible for the capture of data and the entry of data into the system and ensure that information is being input at the appropriate level and reported at the appropriate level. At this stage it is possible to determine how data will be captured, whether on paper or input directly into the system, or both, and by whom. In doing this it is essential to note who will have access to the system. For example, if head teachers cannot access the system at the school level then they will have to submit information to the system via paper forms.

which would be input at the administrative level into the system. If certain blocks cannot input data directly into the system then forms will have to be sent to the next highest level administrative level for data entry. Likewise, in these cases, reports from the system will have to be generated at the lowest administrative level which has access to the system and distributed to the appropriate stakeholders via paper reports.

In reviewing the flow of data through the system we also ensure that all stakeholders will have appropriate access to the data they require to make properly informed decisions. Much of the EMIS data concerning individuals is sensitive and therefore individuals should only have access to the data to which they are entitled. It is also important to review access to data when reviewing the flow of data for an EMIS.

Finally, reviewing the flow of information will also ensure that the department of education becomes more efficient and better informed. This is an opportunity to identify improvements to transformational and transactional processes and on the decision-marking processes, especially those involving high-level, open-ended decisions. High-level, open-ended decision-making processes in EMIS tend to be abstract and intangible. The fact that such decision-making involves a lot of dynamic, unpredictable factors means that it is the quality of individuals and the access to data they have which matter. Enabling EMIS means that individuals can have ready access to data to which they may not have previously had access to. This can help improve the current decision making process.

7.5 Determining a Software Solution

7.5.1 Overview

The requirements document will identify the functional, policy, planning, monitoring and other requirements of the EMIS. This document is fundamental in helping to identify an appropriate software solution to meet the needs of your EMIS.

In developing a software solution there are several options available. The correct choice will depend on the states’ existing systems, budgets and internal resources. These options include the following:

1. Procurement of a readily available commercial solution
2. Agreement and adaption of an existing solution from a state within India
3. Continued development of additional functionality to an existing internal solution
4. Development of a new EMIS

Each of these options will be examined in the section below.

7.5.2 Evaluating a software solution

Care will have to be taken to evaluate each of the options detailed below. When evaluating options it is important to consider the following factors:

1. Whether a solution will meet not just the current needs of the EMIS but also the future foreseeable needs. For example, in the future will the solution enable all offices to have access? Does or will the solution support access via mobile devices in the future.
2. Is the solution cost effective. To do this we must make an assessment of both the upfront cost of deploying a solution and the recurrent costs including support, training and licencing of any software. Factors to consider when costing a solution are detailed in Section 7.12.6.
3. Will the software be deployed to more users or offices in future years and will this impact the performance and costs of the system and if so how?
4. Is the solution well supported technically, will it be well documented and easy to deploy, operate and access?
5. Will the solution integrate with existing software and databases which are used in the state and if so how will it interact?
6. Will the solution protect the data and ensure proper security to access sensitive EMIS data.
7. The time the solution will take to be piloted and rolled out.
8. Will the solution integrate with other systems such as U-DISE and HR systems?

These and sometimes other factors should be considered when selecting a software solution.

7.5.3 Obtaining readily available Solutions

A number of software packages provide support to the function of Education management. Some examples are as follows:

a) HRIS
   a. ADP
   b. CIPHR training
   c. CyberAid
   d. SAP Human Capital
   e. Simply Personnel
   f. Success Factors
   g. Workday

b) Financial
   a. Sap
   b. IBM financial solutions

The specific options for configuration, reports, data and interfaces of each package should be examined against the functional requirements identified in step 2 of this guideline. Each software package comes with specific terms and conditions and software licences are sometimes offered at cheaper rates to state departments operating essential services such as education. However there are usually a number of options available for purchase and deployment of a solution and each will have to be evaluated separately.

1. Costs can vary based upon deployment options such as number of users or power of the processors used to power the server deploying the application. These costs have to be carefully considered when future scaling of deployment is considered. For example you may only intend to deploy to 20% of users in the present year and scale up to 100% of users in 3 years’ time. If the software comes with per user costs (per user license) then cost projections should also be undertaken.
2. Licencing and support costs can be ongoing or annual. In these cases it is recommend to undertake an evaluation of the projected cost over a 10 year period. This will help to make an informed decision on the cost benefits of different procurement and licencing arrangements.

There are free EMIS available via the internet which may also be suitable for your organisation. Some are even open source and allow you to make modifications to the source code. An example of a freely available EMIS is found at the link below:

- [https://www.openemis.org/](https://www.openemis.org/)

OpenEMIS was initially developed by UNESCO. The initiative is coordinated by UNESCO with technical support provided by Community Systems Foundation. The OpenEMIS initiative aims to deploy a high-quality Education Management Information System (EMIS) designed to collect and report data on schools, students, teachers and staff. The system was conceived by UNESCO to be a royalty-free
system that can be easily customized to meet the specific needs of member countries. The OpenEMIS mission is to support UNESCO member countries in developing common database standards for tracking national education indicators, containing high-quality data with adequate coverage and depth to sustain good governance around the agenda of achieving the national and international priorities for education.

Care should be taken when adopting any packaged EMIS solution. Free solutions will usually come with poorer support options but can be a good option for budget constrained departments of education.

In all cases of considering using readily available solutions, care should be taken to ensure that the software:

1. Can fulfil all requirements of the EMIS
2. Can be deployed to all required or planned users of the EMIS
3. Is cost effective to deploy and expand.
4. Is well technically supported
5. Has adequate resources for training such as software manuals.
6. Can integrate with other systems as required (refer section 7.6 below)

7.5.4 Agreement and adaption of an existing solution from a state within India

One good option for any state lacking an EMIS is to adapt one that has been developed in another state. This has the advantages of:

1. Ensuring a solution is adapted that has been proven to be effective for a department of education in a state of India.
2. Strengthening the development and support base for that solution.
3. Encouraging state to state collaboration on system development
4. Commencing the development of a national standard for EMIS for state level departments of education in India.

A good example of state deployed EMIS which are highlighted in this document in section 10 and there are other examples throughout India. Discussions should be held with the relevant authorities to try to encourage piloting and adoption of systems which have already been proven in states of India.

If this option for software deployment is selected then the arrangements for cost and support will have to be agreed between the states. There may be costs associated with this option as the state which has developed the software solution will have already invested considerable resources into the development of the system.

The state level office of the National Informatics Centre (NIC) has assisted Madhya Pradesh to develop and deploy its EMIS and may be able to offer national level support to state development of EMIS in the future. States are encouraged to contact their state NIC to discuss this option further.

7.5.5 Continued development of additional functionality to an existing internal solution

In some cases the state department of education or other state group may have a state level EMIS active or may have a similar and relevant system in place such as the Education Portal in Madhya Pradesh. In these cases it may be desirable to further develop the solution to ensure the requirements identified for the department of education EMIS are included in the system.
This has the advantages of strengthening an existing system and encouraging integration between state systems or systems within the department of education. This is desirable and will help eliminate duplication of education data collection and reporting.

7.5.6 Development of a new EMIS

7.5.6.1 Overview

The final option for obtaining EMIS software is the development of a new EMIS. This is the most difficult path to take as it requires investment of considerable resources and expertise and will take the longest duration. It should only be chosen if the first three options are not suitable.

If this option is selected then it is essential that the SLG appoint an experienced software project manager to lead the process. This is important as software development is a specialised area and poor choices or slippages in development can result in large increases to the software budget. The funds invested in a skilled professional to lead the development will be saved many times over on reducing the likelihood of risks to development.

A piloting, phased approach to development is strongly recommended whereby the software is first piloted on a limited number of users, typically a single block or selected schools, until such time as it is deemed to have passed quality assurance and the software and associated processes have been fully tested and approved.

There are several options for development of the software:

1) Internal Development of software.
2) Development through an approved government agency such as the NIC.
3) Outsourcing development to a company specialising in software development.

These are explained in more detail below.

There are many other decisions that need to be made when developing software. These include:

The software development environment and the database backend. It is best to choose software development and database tools that do not require licencing to deploy. The software development tools should also enable deployment of the solution via the internet. At the time of writing these guidelines, the following tools are recommended:

1) Database back end: MySQL database (https://www.mysql.com/) which is a licence free but powerful open source database environment.
2) Application front end: Microsoft *.Net (http://www.microsoft.com/net)

It is also recommended to develop for a common server and client platform. This is because these platforms are understood by a wide range of professionals and operators and are easiest to deploy on. The savings on licencing for deploying on open source environments such as Linux and the limited support options will be more than offset by problems of unfamiliarity and incompatibility with mainstream platforms.

In the event of bespoke development of the EMIS and associated systems, The Department of Education should be the sole owner of the application source code and database. The developer should hand over the source code (in a suitable media) immediately after the successful acceptance testing of the main version of the EMIS application and at every subsequent revision of the EMIS application.
7.5.6.2 Internal Development of software

This option involves recruiting a team of software developers internally who will undertake the development of the EMIS or else training Department of Education staffs to undertake development. Both of these options require very strong internal management. If a strong software development project leader can be recruited then one of these options is possible however both carry strong risks.

As noted above, software development is a very specific skill. It takes years to train a good software developer to undertake proper and quality software development. This is important to note because if a poorly and rapidly trained person tries to implement software there is a high risk of error with the software, blowouts to software development schedules and end user dissatisfaction. If these factors are realised then the software development budget will be much higher than envisioned. The cost will be much higher than if a good software developer had been hired in the first instance. Time is another issue when internally developing a software team. The time taken to train individuals will result in further delays in deployment of the EMIS.

It is also worth noting that there are often problems of both commitment and retention when training department of education staffs in software development. Department of Education staffs can be assigned a role of software development but may still have to continue with other tasks. This will severely delay software development and will cost time and result in user frustration and dissatisfaction. The other main issue is one of retention. Software development skills are highly specialised and often sought after by commercial organisations and even development partners who are sometimes able to offer far more attractive and lucrative enumeration packages than are government departments. The investment and time to train an individual in software development will be high and there is a strong risk that once trained the individual may leave the department of education.

The other option is to recruit a number of contract staffs to undertake the development. Contract staffs can also be used to maintain the department of education networks and server if the department is intending to host the solution internally. Care must be taken when recruiting and it is recommended to obtain the assistance of an experienced software developer in determining the criteria for recruitment and in screening candidates. Time can be an issue when recruiting a software developer. There will also be delays in the time it takes to find the right developers and convince them to join the EMIS development team. The developer will need to fit the department of education from both a skill perspective and a cultural perspective. Since demand for skilled developers is so high, finding the right developer may take you away from other pressing issues concerning education management.

The final option is a hybrid of the above two options. Both an experienced software developer may be recruited and staff employed under the department of education may be trained in software development. The experienced software developer can also coach and mentor the department of education staffs. This has the advantage of building internal capacity to develop software systems but at the same time ensuring a reasonable level of quality in implementation.

However there are advantages to building an internal software development team. These include:

**Buy In:** Developers who work for the Department of Education full time will develop a strong knowledge of the vision and objectives of the EMIS. They will be investing time and energy into the development and have a vested interest in the outcome and are therefore likely to be strongly committed to the development of the EMIS.
**Relevance:** An internal team will develop a strong understanding of the requirements and operation of the department of education and can help suggest innovations to the system and be a valuable long term resource for sustainability.

7.5.6.3 Development through an approved government agency such as the NIC

There are state based government agencies which are responsible for supporting government departments to develop software solutions. A good example of a main state agency for support to development and hosting of ICT solutions is the National Informatics Centre (NIC) which typically has an office in each state. The NIC should be consulted early in the process of developing an EMIS. The NIC may also be able to build on work undertaken in others states thus strengthening a national platform for development of EMIS and associated systems such as a full Education Portal for education information.

7.5.6.4 Outsourcing development to a company specialising in software development

Another option is to outsource development to a software development company through a competitive bidding process. A software development company will have a ready team of experts who are experienced in the development environment selected and will have ready configured tools to help speed development. The company can have input into the design process and suggest improvements. This option is generally preferable to developing internally however there are issues which need to be considered:

1) The company should be accountable to the development through a strong process of quality control and a phased milestone approach to payment. This of course places extra requirement for management on the Department of Education staffs which is another reason why software development is not a preferable option for development of EMIS.

2) The contract arrangements must specify full ownership of the software code, database and data to the department of education. Iterations of the software code should be submitted upon each development milestone for review by the department. This review is best outsourced unless specific expertise exists within the department.

3) The contract should specify a support window wherein changes and bugs can be requested within controlled parameters. This support window should typically be 12 months. In many such software projects – a one year comprehensive warranty is the practice followed.

4) A longer term support agreement by way of Operations & Maintenance (O&M) or simply Maintenance may be agreed with the software agency for up to five years. This provides security for operation and deployment of the software as well as allowing for required changes to the software if ministry processes change or if the software is to be expanded in future years.

As noted in Step 5: approximately 15% of the annual development budget should be reserved for changes and support to the software on an annual basis.

7.5.7 Conclusion

The preferred option for EMIS software is certainly to obtain completed and thoroughly tested software. This can either be done by:

1. Working with the state NIC or other state department of education to obtain rights to use a previously built and tested EMIS applicable to India.
2. Obtaining a ready built solution which is either open source or supplied by a commercial company.
3. Working with another state department that has already deployed an EMIS.
These three options are preferable to fully developing EMIS software. The full development of EMIS software should only be chosen if the three options above are not feasible owing to cost of functional issues.

If the full development of the software is to be undertaken internally then it is recommended to outsource to a company through a well-developed tender and contract arrangement. This in and of itself requires considerable resources and managing the development will take further resources as well as time. It is therefore strongly recommended to obtain a pre-built solution if possible.

### 7.5.8 Adopting a “Step” Approach to development of EMIS

A "step" solution is most appropriate for contexts that do not yet have the resources or infrastructure to support a complete and mature EMIS. The step solution uses and improves existing tools, systems and processes to quickly start collecting and using EMIS data while progressing in manageable steps toward a more complete EMIS.

A step solution involves determining which functions and reports are of the highest priority and implementing those first. Modules to the EMIS can be categorised and prioritised in this manner to enable higher priority items to be developed and deployed first. For example, if student information is the highest priority then a student information module can be deployed first, this enabling tracking of school children throughout their academic career.

If modules are implemented in steps then the full solution may take years to roll out. There is a risk that the development will only be partially complete which could result in user dissatisfaction. In these cases there is a strong risk of the EMIS becoming redundant with out of date and old data and eventually falling into disuse.

### 7.6 Migrating Data to the New EMIS from Legacy Systems

#### 7.6.1 Overview of Data Migration

The success of the EMIS will depend on the quality and completeness of data within the system. If the data is incomplete or inaccurate the users will become disillusioned over time and may revert to the previous information system or paper based system. Therefore it is important to initially populate the EMIS with timely and relevant, high quality education data so that when the system goes live it can be used normally and as intended by all users.

There are several options for populating the EMIS. These include:

1. Migrating data from legacy systems, either other software systems or databases containing education data.
2. Importing data from U-DISE.
3. Conducting a baseline census on all schools.

Each of these methods will be examined in more detail in the sections below.

Data migration is a key element to consider when adopting any new EMIS, either through purchase or new development. This situation applies when there is already an existing EMIS upon which to draw data to populate a baseline for the new EMIS. One would think that any two EMIS that maintain the same sort of data must have performed similar tasks. Therefore, information from one system should map to the other with ease. However, this is rarely the case.

---

9 This section has been adapted from [http://www.infotechnet.org/ntca/DataMigration.htm](http://www.infotechnet.org/ntca/DataMigration.htm)
Some key terms in understanding data migration are:

- **Legacy data** is the recorded information that exists in your current EMIS storage system, and can include database records, spreadsheets of staff, text files, scanned images and paper documents such as personnel records that may exist at the department of education block office. All these data formats can be migrated to a new system. For most Departments of Education legacy data will be available through U-DISE going back to at least 2011 however the quality of the data will be variable and the data standards are not robust.

- **Data migration** is the process of importing legacy data to a new EMIS. This can involve entering the data manually, moving disk files from one folder (or computer) to another, database insert queries, developing custom software, or other methods. The specific method used for any particular system depends entirely on the systems involved and the nature and state of the data being migrated.

- **Data cleansing** is the process of preparing legacy data for migration to a new system. Because the architecture and storage method of new or updated systems are usually quite different, legacy data often does not meet the criteria set by the new system, and must be modified prior to migration. For example, the legacy system may have allowed data to be entered in a way that is incompatible with the new EMIS. Architecture differences, design flaws in the legacy system, or other factors can also render the data unfit for migration in its present state. The data cleansing process manipulates, or cleans, the legacy data so it conforms to the new system's requirements.

### 7.6.2 Sources of Historical Education Data

Historical data is any data which is not reflective of the present situation. For education data this typically involves any data pertaining to enrolments, teachers, finances and often education facilities and other data which is not from the present year.

Historical education data may exist in a variety of systems which include Human Resources Information Systems (HRIS), U-DISE, records at the school such as enrolment and attendance records, asset management systems and financial systems. In most state systems, school level education data going back to 2011 will be available in U-DISE. This data was merged when the two older systems, SEMIS and DISE, were developed into a single system. Issues with U-DISE data are noted in section 3.5 and will limit the degree to which historic data can be migrated to a new state EMIS.

### 7.6.3 The Decision to Migrate Legacy EMIS Data to the new EMIS

The "Do we migrate legacy data?" question has been asked ever since the first governments put data in one repository and decided to change systems. Here are some commonly asked questions:

- Should we bring the data over to the new system?
- If so, should we bring all or part of the data?
- If just part, which parts? - based on creation date? Based on status of case open or closed? Or some combination of these?
- If we choose to bring over data on or after a certain date, which should it be - last 3 months, last 6 months, last year?...should it be all the data?
- Should we filter in or out specific data?
- Are our desired criteria extractable from the existing database?
- Are the desired fields of data importable into the new system?
- Is data migration from our legacy system included in the purchase of the new system?
- If not, do we have the expertise in-house to script an automated process to migrate the data?
- If not, will we hire someone to do this?
- Will we perform this task manually?
When deciding on data migration, all factors should be examined before making the assumption that the whole dataset or none of the dataset should be moved over to the new EMIS. The proof is in whether these data records will be used and acted upon when the new system and process is in place. Two key variables to consider in deciding on data migration include data volume and data value.

**Data volume** is the easiest variable in the decision process. How many data records are we considering to migrate: 1000, 10,000, 100,000, 250,000? How many are expected to come in to the new EMIS on a weekly/monthly basis to replenish this supply? Check to see if there are any technical barriers to bringing over a certain amount of data and also if large databases will affect performance of system functions like searching. If not, then 10 records or 100,000 records should not make any difference.

If volume is low, then it may be well worth doing a migration so there is some database for users and for trend analysis. If volume is high, then it may make sense to examine the age/value of the data and start filtering on certain criteria.

**Data value** is a much harder variable in the decision process. Many times there are different perceptions concerning what value the existing data provide. If Department of Education staffs are not working with older data in the current EMIS then the chances are that they may not work with older data in the new EMIS even with improved search functionality. If migrating, you may want to look at shorter-term date parameters - why bog down a system’s performance with data that are never used and why waste resources migrating this data into the EMIS?

Criteria, as discussed in the questions above, can be date parameters, but can also include other factors. Extracting the exact data based on some of these factors will depend on the abilities of your current system and database as well as the ability to write the detailed extraction script. Keeping it simple when possible is the best approach. However, there may be circumstances where filtering data may make sense.

Once you have determined which data you want to migrate, then determining what parts of the staff record will also be important.

### 7.6.4 Effectiveness of Historical EMIS Data

There are limits as to how effective historic data will be for education planning, management, monitoring and evaluation and its usefulness must be assessed against the effort required to ensure historic data. When assessing whether historical EMIS data will be useful it is necessary to consider the type of data and its level of aggregation.

In a fully developed EMIS, data will either be drawn from a variety of sub-systems and warehoused at the national level or will be derived from a fully integrated EMIS (refer section 3). There will likely be historical data available and aggregated to block or district level through prior publications. The accuracy and consistency of the data may be questionable however this represents official state data and therefore should be referenced when reporting on the historical evolution of the education system. Data on individual items may not be easily available.

#### 7.6.4.1 Data on teachers and other staffs:

If the state is operating a HRIS, data on teachers and other staffs should contain the full service record on all staffs linking to institutions (schools) in which staffs were employed. U-DISE contains data on all teachers to at least 2011 however the data lacks robust standards and is stored in separate data bases for each year. The effort of migrating data from U-DISE to obtain a service record of each teacher would be time and cost prohibitive. Therefore a baseline survey is recommended. For more information please refer to the Guidebook for Development of Human Resource Information System for State of India (RMSA TCA 2015b).
7.6.4.2 Data on students:
U-DISE stores aggregate data on students to at least 2011 using a variety of parameters for aggregation. These include gender, age, class, ethnicity, religion. Data required for calculation of flow rates including dropouts and repeaters is also stored in U-DISE. This data will be sufficient for EMIS operating from aggregate tables but will not be suitable for migration to student tracking systems which will require individual student data to operate. If a student tracking system is to be implemented then a baseline survey on all students is recommended.

7.6.4.3 Data on Facilities.
U-DISE stores aggregate data on facilities and the condition of facilities including Water, Sanitation and Health (WASH), classrooms, sports facilities, teacher and administration facilities and accommodation facilities.

7.6.4.4 Finances
U-DISE stores data on school level finances however the resolution of the data may not be sufficient for many state Department of Education purposes. Further financial data may be required from schools particularly in situations where the Department of Education is closely monitoring school expenditure and schools have substantial discretionary spending.

7.6.5 Methods of Migrating Education data to the new EMIS
Once the decision is made to perform data migration and before migration can begin the following analyses must be performed:

- Analyse and define source structure (structure of data in the legacy system)
- Analyse and define target structure (structure of data in the new system)
- Perform field mapping (mapping between the source and target structure with data cleansing, if necessary)
- Define the migration process (automated vs. manual)

To analyse and define source and target structures, analysis must be performed on the existing system as well as the new system to understand how it works, who uses it, and what they use it for. A good starting point for gathering this information is in the existing documentation for each system (if available!). This documentation could take the form of the original specifications for the application, as well as the systems design and documentation produced once the application was completed. Often this information will be missing or incomplete with legacy applications, because there may be some time between when the application was first developed and now.

If the legacy system is a software system then you may also find crucial information in other forms of documentation, including guides, manuals, tutorials, and training materials that end-users may have used. Most often this type of material will provide background information on the functionality exposed to end-users but may not provide details of how the underlying processes work.

Another key area to examine is how the data in the system are stored (i.e., in flat files, files, or tables). What fields are included in those files/tables and what indexes are in use? Also, a detailed analysis of any server processes that are running that may be related to the data must be performed (e.g., if a nightly process runs across a file and updates it from another system).

Now that the source and target structures are defined, the mapping from the legacy to the target should fall into place fairly easily. Mapping should include documentation that specifically identifies...
fields from the legacy system mapped to fields in the target system and any necessary conversion or cleansing.

Once the analysis and mapping steps are completed, the process of importing the data into the new system must be defined. This process may be a combination of automation and manual processes or may be completely automated or may be completely manual. For example, a process may:

- Create data extractions from the legacy system
- Cleanse the data extractions according to mapping guidelines
- Import the data extractions into the new system using that system's import feature
- Verify and test samplings of the data in the new system by comparing data reports to the old system

**Bottom Line.** Data migration is a key element to consider when adopting any new system either through purchase or new development. Data migration is not a simplistic task and if not given due consideration early in the process of developing or purchasing a new system it could become a very expensive task.

### 7.6.6 Importing data from U-DISE system

Populating the EMIS from data in an existing system is the easiest and optimal way to ensure proper EMIS baseline data is available in the EMIS for the wide launch of the system. However care should be made to validate the data to ensure it is both correct and complete, prior to finalising the baseline (refer section 7.8 below). There are issues when importing data from U-DISE into a proper relational database. Care should be taken to ensure that all teacher and school codes are consistent year to year or errors will occur.

### 7.7 Baseline Data Capture

#### 7.7.1 Overview

For some data such as individual student data, legacy systems and data will not be available and even if they are available the data contained in them may be in a format that prohibits migration to the new system or may not have been maintained and updated properly. Therefore in most cases a complete baseline data capture is recommended as the method to populate data required for these sub-systems.

#### 7.7.2 Strategy for Baseline Data Entry

The baseline capture must be properly budgeted for.

Baseline data capture generally has four phases:

1) Development of Baseline Data Capture Forms
2) Distribution and completion of forms
3) Data entry
4) Data quality and completeness assessment.

#### 7.7.3 Development of Baseline Data Capture Forms

Baseline capture for HRIS is perhaps the most difficult baseline data to capture and is covered in the companion guide *Guidelines for Development of State Human Resources Information System* (RMSA TCA 2015).
Baseline data for schools should be captured for the present year. Enrolment should be captured for at least two years to ensure flow rates can be calculated such as dropout rate, promotion rate and survival rate.

Baseline data for individual students can also be very difficult to capture as it requires inputting the details of all students in the state and their academic details. Once the first year’s data is captured, ensuing years only require the data to be updated and for new intakes to be captured and input into the system. This will usually be undertaken using the baseline data capture forms.

### 7.7.4 Standardize Data Collection Forms to Ensure Completeness

Data completeness is critical for producing meaningful, functional reports that are used to inform decision-making. Review paper data collection forms to ensure that they match any electronic forms and database structures. Make sure that data collected are consistent across blocks, districts, facilities and cadres. Streamline forms so data are collected only once from each respondent.

Standardizing data collection forms can facilitate ease-of-use as well as data quality. A good method of standardization is to add selection menus or checkboxes to the form for lists of data, rather than requiring the respondent to fill in a response.

Critically consider form design to eliminate confusion and errors. Each field on the form should meet a specific goal, such as answering one of the SLG’s policy and management questions. When designing a data collection form, ask why you are asking each question. If there is no good reason, consider removing the question. This will also result in a simpler form that is easier for respondents to complete, which may help ensure compliance.

Before distributing forms on a large scale, pilot-test the forms, asking one or more people who have not previously seen the forms to complete them. The piloting process helps ensure that confusing questions or formatting can be identified and addressed before the forms are put to use (refer section 7.12.4)

### 7.7.5 Distribution and completion of forms

Forms must then be distributed and completed and returned for data entry. This can be done using one of two methods.

A. **Head Teachers or other school staffs assigned to EMIS access the system and input data directly into electronic forms**

B. **Head Teachers or other school staffs assigned to EMIS complete paper forms and submit to the first administrative level able to input data to the EMIS.**

The first option is the best option, as it distributes the task of data entry and management to the school level which is desired under EMIS. Schools can manage their own data and administrative levels can verify and validate data. However this method also relies on capacity level being sufficient at the school to enable data entry. This may only be the case in selected schools. It requires a robust internet connection (for web enabled solutions), a reasonable computer and an understanding of the application by school level staffs.

The second option may require substantial data entry at the administrative level and will prohibit the level of information which can be captured in EMIS (refer section 3).

In both cases all staff will have to be orientated in the completion of the baseline data capture forms and this will take time and resources. At least a two hour orientation session should planned for, usually using the cascade training model whereby block supervisors can deliver training to all staffs.
within a block. Training will likely need to be more extensive if data entry is to be undertaken by school staffs.

7.7.6 Data Entry

There are various ways to have the data input into the system and each will have a different impact on budget and data quality.

The best systems are those which have meaning to the producers of the data and allow the producers to engage with and alter the data on a regular basis. School information systems (refer section 3) are systems which engage the actors at the school level and are therefore excellent tools to engage head principals and teachers in the use of the system. It is likely that at the time of publication of these guidelines, most schools in India are not yet be able access the internet and engage with a school information system. Therefore, the most suitable level at which to input baseline data is the block level which is closest administrative level to the school. This can also be a good way to increase administrator’s skill in the use of the new EMIS. It should be noted that the data volumes for input of baseline data will be high and therefore it may be necessary to allow the blocks to recruit additional data entry staffs to help input the data.

If the EMIS or the method of deploying the EMIS do not allow for this then the data can be input centrally. This typically requires having a substantial data entry phase where data is input centrally for regions to be activated on the EMIS. It is usually necessary to recruit a sizeable team of data entry operators to input the data over a short period of time. Alternatively this can be outsourced to a commercial data entry company. This can save on overheads such as hardware and office space.

Automatic scanning technology can be employed for data entry if the forms are designed for this, however forms designed for automatic scanning are usually very long and cumbersome to complete. The volume of information for one individual is high and thus automatic scanning is likely not a feasible option for baseline data capture.

Baseline capture must occur shortly before or during the launch of the EMIS or the data will quickly become obsolete and require substantial updating. If the EMIS is to be launched in different regions at different times then the data for each region should be input at the time of launch.

Data entry should be well managed and quality controlled by a qualified professional. The software should also help to improve the validity of the data.

7.7.7 Reduce Errors in Data Entry

Establishing procedures to minimize data-entry errors when transferring data from paper forms to electronic format often results in improved data quality. Dual data entry, in which a paper record is entered into an electronic database at two separate times by two staff members, is the most effective way to reduce errors; any discrepancies between the two entries can be compared against the original document and corrected.

Should dual data entry be prohibitively expensive or time-intensive, a system of spot-checking, in which a randomly selected list of electronic records is checked against the originals, can be substituted. Logging data-entry errors and reviewing errors serves as a starting point for improvements in training methods, data collection forms and software modifications.

To validate data, have employees review their own records, if possible. Additionally, education professionals can validate their information when they renew their registrations or licenses. Another way to validate data is to provide regular reports to representatives at the district or facility level, which can then be reviewed and updated.
7.8 Planning for Capacity Development of Staffs

7.8.1 Overview of Capacity Development

Piloting and rollout of the software will also require EMIS users to be trained in the new tools at all levels of government. There are three types of staff capacity development (training) which must be considered. These are as follows:

1) Training staffs to complete forms: Which is generally required for all staffs so that they understand how to access and use the new EMIS forms for recording information.

2) Training of Technical Users: which is for those required to access the software for data entry and reporting, will have to be trained technically.

3) Training for managers to generate and understand reports: Which is generally required for managers who need to either access reports directly or to understand and interpret reports derived from the system for the purposes of compliance and decision making.

In cases where the department of education is either developing the software or hosting and maintaining the software then additional specialist training may be required for individuals responsible for the highly specific technical tasks associated with each of these functions. As these are very specific to the software, deployment choices and other factors, this type of training is not further elucidated in these guidelines.

7.8.2 Training staffs to complete forms

All staff under the department of education should be trained in how to complete forms required for data capture for the EMIS and in how to access those forms. The method of accessing forms will depend on the system. Generally forms are made available online through a dedicated EMIS website along with training material (refer section 9.3).

As noted above, cascade training models are usually employed for this type of training which usually involves training a core cadre of trainers at the state level who can then train trainers at the district level. The district level trainers are then responsible for training block level trainers who should train all staff within their block. In situations where there are very few districts it may be possible for state trainers to train block level trainers directly.

There are many factors that are important when considering the implementation of a cascade training program. One of the most challenging issues is to maintain quality in the training program for the lower level trainers such as block level. The link below provides a good resource to review when planning cascade training programs:


7.8.3 Training of Technical Users

All users who will be accessing the system should be technically trained in the system. Technical users must be trained to input data, generate reports and use processes within the software that are applicable to their job role and access to the system. Upon the introduction of a new EMIS, technical training is often repeated a number of times over a six to twelve month period. When changes are made to the system, technical training must often be reinforced or repeated. It is also important that technical support is easily accessible both online and locally for all users. This issue is covered more under sustainability (refer section 9)

The cascade training method can also be employed for technical training of users and is usually most effective training method. It also has the benefit of strengthening a local cadre of trainers in the
system who can offer support. However the risks of loss of quality in training are higher with the increased technical requirements of the training so care should be taken to ensure quality is maintained when implementing cascade training.

Technical training should commence when users have access to the system and not before. Training without systems in place will be largely wasted if users cannot return to commence work directly on the EMIS.

7.8.4 Training for Managers to administer the system

In any EMIS there will usually be a small number of managers who will have access to the administrative functions of an EMIS. These usually enable users to determine and adjust parameters within the system and to grant rights to access or change and to report education data. These responsibilities are critical to the operation, security and proper functioning of the EMIS. It is important that these staff are thoroughly trained as administrators of the system. These users will be required to understand who should have access to which data and how. There will usually only be a small number of managers with this access but the training should be intensive and thorough. The specific details of the training will depend on the EMIS software being employed.

7.8.5 Training for managers to generate and understand reports

Introduction of an EMIS will result in the change of processes and reports. New reports in different formats will be available to decision makers. Many managers who may not have previously been able to gain access to reports will now have ready access to information on which to inform decision making. This will result in a paradigm shift in the department of education away from what one thinks they know towards basing decisions on empirical data and facts.

This will take time as it involves not just a shift in technical knowledge but sometimes a shift in organisational and individual culture. Such a shift is usually accelerated with strong leadership. A head of department of education or head of a key department such as Planning who is committed to a change in organisational culture can accelerate this process.

Nonetheless there is also a need for managers to receive training in both how to access reports and how to use the new EMIS reports for education planning, policy determination and other functions. Management training is best undertaken directly and repeatedly. Initial training can be quite intensive and can depend on the level of understanding managers already possess and the system they are used to operating. If there has not previously been an EMIS active in the state then training may have to commence with basic concepts of decision making and understanding EMIS processes.

7.8.6 Using the internet to reduce training costs and increase support

In states with good internet connectivity to all offices, training and support via the internet is feasible. For example, Madhya Pradesh is able to significantly reduce costs of training in the education portal by training via web seminars over the internet. This is further evidence of the savings of investing in good connectivity to all offices. This is a better and more cost effective method to training than cascade training and should be considered by all state departments of education.

7.9 Inclusion of Non-Department of Education Schools in EMIS

It is important to have a holistic view of the education system in order to properly plan and administer the system and ensure all communities and groups, including marginalised and disadvantaged children, have proper access to quality education. Therefore it will be important to have detailed, timely and quality information on all schools in the state available through the EMIS. Most education
institutions in India are managed by state, district or block Departments of Education through the
government. There are also some institution which are managed through the national government.
However there are also a great many education institutions which are not managed through the
government but on which information should be available in order to properly plan and administer
the education system. These Non-Government Institutions MAY include:

1. Schools managed locally by the community or privately owned and managed.
2. Schools operated donor funding such as grant programs
3. Schools managed through Non-Government Organisations (NGOs).
4. Schools managed through religious institutions.

It is desirable to have some details on these schools in order to assess the complete picture of
education access and quality being delivered throughout the state. Therefore these schools should,
be included in the EMIS however it may not be necessary to collect all data required to administer
government schools for Non-Government Schools.

It is common to enact legislation to require that all institutions to comply with minimum state data
requirements. Non-government institutions then have a responsibility to comply with the
requirement and ensure staff details are maintained in the EMIS. However, data for non-government
schools does not need to be as detailed as for Government. For example it may not be necessary to
have detailed financial information for non-government schools nor to have detailed information on
all facilities. It is only necessary to collect that data required for monitoring, evaluation and planning
of the education sector and each of its sub-sectors and to ensure that education institutions are
meeting minimum quality criteria. It may be sufficient to capture general information on non-
government staffs and update in the EMIS annually. A process should be considered for this purpose
so that all staffs active in the education sector in a state are monitored through the department of
education.

7.10 Determining the Implementation Modality, Schedule, Criteria
and Budget

7.10.1 Overview

This section outlines the other criteria that are important to consider when developing a successful
EMIS implementation plan. Such criteria is important when planning for any implementation of a
software system but is outlined below specific for departments of education implementing EMIS.

7.10.2 Implementation Modality

The implantation modality determines how the implementation will be broken down and scheduled.
There are generally two types of implementation modality. These are:

- Incremental implementation or phased approach
- Parallel execution
- Or a combination of the above.

The schedule can be determined by breaking down all the stages of development into tasks and
assigning resources to each task. You can then determine which tasks should proceed before others
and identify milestones or main outputs of the process. A good EMIS project manager should be able
to direct a high quality implementation plan. Project management is a very specific skill which should
be consulted in designing when developing the implementation plan.
In general the phased approach works well for implementation of EMIS as it helps ensure that key development milestones can be met before new tasks are commenced. This prevents common issues such as commencing training before systems are installed and helps ensure the best application of resources.

7.10.3 Defining and organising Tasks

Each major task required for the implementation of the EMIS should be clearly identified. Each task should be clearly identified and described. The following should be identified for each task:

- What the task will accomplish
- Resources required to accomplish the task
- Key person(s) responsible for the task
- Criteria for successful completion of the task

Examples of major tasks are the following:

- Providing overall planning and coordination for the implementation
- Providing appropriate training for personnel
- Ensuring that all manuals applicable to the implementation effort are available when needed
- Providing all needed technical assistance
- Scheduling any special computer processing required for the implementation
- Performing site surveys before implementation
- Ensuring that all prerequisites have been fulfilled before the implementation date
- Providing personnel for the implementation team
- Acquiring special hardware or software
- Performing data conversion before loading data into the system
- Preparing site facilities for implementation

The sequence of tasks should then be identified. Where possible tasks should be grouped together or simplified without losing valuable information. Once all tasks are agreed a final implementation plan can be developed. Consult the online resources for more information on development of a full implementation plan and schedule of tasks and resources.

7.10.4 Piloting the EMIS

Strong consideration should be given to a lengthy pilot of the software and processes during which all aspects of the new system should be thoroughly tested and examined. A pilot should ideally be limited to a small geographic area which is close to the department of education. This will help reduce the resources required to undertake the pilot in terms of travel and logistics. It will also help ensure that the core implementation team can easily visit the pilot sites during the pilot.

Some people advocate undertaking a pilot in a disadvantaged and remote area as well as a developed area. **This is not recommended.** The pilot is intended to test the EMIS in a functioning environment. Poorly function or disadvantaged areas can later be developed to be able to cope with the system but if the system is piloted in these areas the issues inherent in such areas such as poor infrastructure, communication technology and long travel distances will adversely impact the pilot and result in far more resources being expended than is necessary. The pilot area must be willing to commit time and resources to the implementation but will benefit from being the first region to adopt the new system and practices.
In general a pilot should:

1. **Test all processes, functions and implementation issues of the new EMIS.**
2. **Be complete when identified benchmarks are met:** Benchmarks should be established for the successful completion of the Pilot. The pilot should be completed only when all benchmarks are established.
3. **Manage Risk:** The pilot project can be used as an opportunity to implement the EMIS in a limited capacity where the impact of failure is limited. Once the pilot project is executed, the risks that were identified at the beginning of the project can be evaluated in terms of the actual EMIS being implemented in the department of education. It is important that the risk evaluation be reasonable in order to be confident with the risk that will be carried forward to a full implementation project.
4. **Validate Benefits:** While risk falls on the cost side of the equation, an EMIS would not be considered unless it had some reasonable perceived benefit. Often times the potential benefit of a new EMIS is an area of much debate and most departments of education tend to struggle with understanding and/or quantifying a solution’s benefits. A pilot project is a great opportunity to discover and/or validate benefits by applying the EMIS in a limited-scope fashion.
5. **Evangelize Change:** The biggest hindrance to change in any organization is the people within it. Regardless of how much you ‘sell’ the EMIS solution with statistics and qualitative benefits, there are always those that will only ‘believe it when they see it’. As such the pilot project can be a great approach to appeasing the dissenters of the organization and bringing them along as supporters.
6. **Evaluate privacy and Security:** The EMIS deals with a great amount of personal and confidential information. The pilot is a good chance to test security and privacy protocols and policies prior to the broad rollout of the EMIS.
7. **Developing and Validating Support:** The pilot is also a good chance to test and validate support for the solution. This will be essential to ensuring a smooth rollout of the application and ensuring minimum levels of frustration is experienced by managers and staffs alike.

### 7.10.5 Evaluating the Cost of the EMIS

The cost of the EMIS refers to the total cost of development and implementation of the EMIS to the department of Education including all aspects of support. Often the cost is constrained by department of education budget allocation. In other words, the amount allocated to development of the EMIS will be fixed and the solution will have to be tailored to come under the budget.

There are two parts to the cost, the **cost of development** and the **increment to the operational costs** and each is explained briefly below.

### 7.10.6 Cost of Development

The development budget is the total cost for developing and implementing the EMIS. It includes the budget for all activities, resources and procurements that occur one time only during the development phase of the EMIS. The development budget can be calculated by summing the individual budgets for all tasks, resources and procurements required for the implementation. The budget typically does not include the salaries of department of education staffs but does include the salaries of any contractors or other services required to support the development. It should also include the costs of all trainings conducted during the implementation.

Once the cost of development is determined it should be broken down to represent the cost to the following:

- Capacity development (training by stakeholder group)
- Procurement and development (hardware and software)
The cost should also be broken down to show the cost of each phase of development including the pilot.

7.10.7 Increment to the operational costs

The operational costs are the expenses which are related to the operation of a system, or to the operation of a device, component, piece of equipment or facility related to the system. They are the cost of resources used by the department of education just to maintain the EMIS. The cost of operation is usually calculated on an annual basis. It should include the cost of:

1. Replacing hardware, which is typically estimated at 15% of total hardware costs.
2. Changes and support to the software (typically 15% of procurement or development cost)
3. Contract technical staff required to maintain the system.
4. Services required to maintain the EMIS such as internet hosting services.
5. Recurrent training requirements (refer section 7.2.1)

Generally internet costs should not be included as the internet is becoming essential to the operation of a department of education at all levels and the costs are shared amongst many processes, departments and users.

The operational costs should be determined before system implementation for the existing system. The operational costs should be estimated for when the system is fully operational. The increment to operational costs is therefore the difference between the operational cost before implementation and that after.

7.10.8 Estimating Cost benefits

It is very difficult to fully estimate the cost savings and other intangible benefits to implementing an effective EMIS. There are so many benefits as noted at the start of these guidelines and many are very difficult to cost. However as a general argument, if an EMIS results improves allocation and deployment of resources resulting in a 2% efficiency gain through improved utilisation of existing resources, then this would represent a large cost saving to the education system. In addition this will help result in ancillary benefits such as improved targeting of disadvantaged pupils and remote or poorly serviced communities. Therefore the investment into EMIS will usually be returned in a very short period of time and will be substantial in the longer term.

7.10.9 Cost Scenario planning

After calculating the final development and operational budget there may well be a significant difference between the allocated budget and the estimated costs. If this is the case then different scenarios need to be considered to help reduce costs. Issues to consider when reducing costs are:

Is support and training implemented cost effectively? As noted above remote training via the internet can help reduce costs but is only feasible in states that have invested in good internet connectivity to all offices of the state department of education.

1. Is the hardware essential? Can we reduce the hardware budget?
2. Can we use open source software?
3. Can we implement in phases over a longer period of time? Proof of concept of an EMIS can help generate political will for EMIS which can help increase funding.
4. Can we generate and distribute reports and other publications electronically rather than printing in hardcopy?

These and other questions need to be considered when trying to reduce budget.
7.10.10 Risk Assessment

There are potential and unanticipated roadblocks in department of Education that can pose a risk to the successful implementation of an EMIS. For example, are there pockets within the Department of Education that are resistant to change? Are there any sector wide initiatives that will conflict with the timing of the EMIS implementation and would compete for your effort, or reduce stakeholder availability? Are there special interest groups with strong lobbying capacity, such as private school collectives, who may have objection to some aspects of the EMIS? A risk assessment will identify these risks and outline how they will be managed or overcome. It is far better to have identified the risks upfront and have a plan for dealing with them, than to be doing so in the midst of an implementation. Senior management support may be necessary, depending on the nature of the plan that is developed to mitigate identified risks.
8. Step 4: Implementing the EMIS

**Goal:** To successfully implement the planned EMIS solution.

If a good implementation plan has been developed then the chances of implementing a successful solution significantly increase. Therefore this section will help you to ensure that you have a successful implementation by directing you to important aspects of preparation and quality assurance during the implementation phase.

### 8.1 Communicating Change to all Staff

During implementation of the EMIS it is important to have managers and supervisors lead staff and be effective agents of change. The first step in engaging managers and supervisors as leaders of change is getting them on board with the change. A manager must be supportive of a change before he or she can successfully lead direct reports through the change process. To achieve this, the department of education management must have specific activities aimed at building support with managers and supervisors.

It can be helpful to prepare a communication plan to help promote and focus staffs on the new EMIS. A portion of the plan should be focused on managers and supervisors, explaining why the EMIS is being implemented, the benefits of the EMIS and the potential of the EMIS from the manager’s perspective. These communications should start very early in the implementation phase to ensure adequate time before the managers and supervisors are asked to communicate with their reports. In addition to general change messages, specific messages about the role of managers and supervisors and how to lead and direct reports should be communicated. Communications should come from preferred senders, in this case the senior staff within the department of education, usually the permanent secretary and minister. Two-way communications are critical with this group to allow for exchanges and feedback.

Finally, resistance management planning should focus on the manager and supervisor group. The manager and supervisor group has often been identified as the most resistant to change. Proactive resistance management plans that address the key concerns of managers and supervisors – such as loss of control and workload issues – are required to anticipate and mitigate resistance from managers and supervisors.

From a change management perspective, managers and supervisors should first be treated as a group of employees impacted by the change. The first step to engage this group in their role of leading change is to ensure that they are supportive of the change and that resistance from the group has been managed.

Another very important group to be engaged in the process are head teachers. Head Teachers will be responsible for providing timely, complete and accurate information on education institutions and are therefore key actors that must be supportive of the system. As noted in section 3, the best EMIS have relevance to the producers of the data which are the actors at the school level. Therefore Head Teachers should lead schools in the provision of quality data and, if possible, should encourage staffs to engage with the system. Given that an EMIS can affect resource allocation to schools it is essential that head teachers be educated on the benefits of the EMIS. It may be advisable to establish a support facility which can be a contact number or an online resource where issues can be posted and responded and viewed by other members.
8.2 Determine Data Flow and Obtain Compliance for Sharing Data

It is essential to manage access to aggregated education data to facilitate planning, monitoring, evaluation and research across sectors, including nongovernmental organizations, academic researchers and policy makers. This kind of data-sharing improves accuracy and allows everyone to make better decisions. Processes should be put in place to facilitate the flow of data and reports between the central and district levels, as well as schools and other education centres and other education service providers, while ensuring the security of sensitive information. This exchange of information not only improves accuracy, but also enables education planners at all levels to gain access to information valuable for policy and administrative decisions.

The SLG should determine how data should flow among education centres, schools, blocks and districts and to the central department of Education, with reports regularly returning to each. An individual responsible for collecting and sharing data at each point should be identified.

8.3 Regular Implementation Meetings and Project Tracking

As recommended in Step 3, a good EMIS project manager should be employed to oversee the implementation of the EMIS. The cost savings for having a skilled professional leading implementation will be realised through reduction in errors, poor technical choices, problems and wasted time and resources.

A key function of this person should be to hold regular meetings with all parties concerned and to consult all parties on risk and progress against the implementation plan. The specific meetings will depend on the choices for implementation and deployment made in step 3 however in general meetings should be conducted on a regular basis with:

- The SLG
- Key Department Managers and supervisors
- Any service providers such as software development companies or online hosting services

The project manager should update a project implementation status report on a monthly basis and circulate to key stakeholders.

8.4 Reporting to the SLG

As noted in Step 2, the SLG is the dedicated steering group for the implantation of EMIS. The SLG should meet to evaluate the progress of the implementation at least quarterly during the implementation phase. The risks, progress and impact on budget should be reviewed at these quarterly meetings.

8.5 Maintain Data Security and Backup

Although sharing data is essential for maintaining quality data and encouraging evidence-based decision-making, data integrity and security are critical elements of building trust in any system. EMIS data include personal information that must be kept secure, and therefore aggregated data should only be shared among an appropriate, approved audience.

During implementation the SLG should strengthen a data-sharing policy. Methods of securing data should be tested and strengthened during implementation.

Backing up and retrieval of data should be undertaken on a regular basis. Backup should be maintained in several different sites or through the cloud (redundancy). Over time the value of the
data will increase as more person hours will have been invested into its collection, processing and use. The loss of any data can be devastating to a department of education.

8.6 Closing the Implementation Phase, Post Implementation Review (PIR) of the EMIS

8.6.1 Overview of the PIR

The implementation phase can only be considered completed when the full objectives of the system have been met as determined in Step 3. At the conclusion of the implementation phase a full post implementation review should be undertaken.

A Post-Implementation Review (PIR) is an assessment and review of the completed EMIS. It will be performed after a period of live running, typically within six to twelve months after the implementation of the full EMIS is completed. The PIR is intended to be an assessment and review of the final working solution. There should have been at least one full processing and reporting cycle completed. It should not be performed while the initial snags are still being dealt with or while users are still being trained, coached and generally getting used to its operation. The PIR should be timed to allow the final improvements to be made in order to generate optimum benefit from the EMIS. There is no point in waiting too long as the results are intended to generate that final benefit for the department of education.

There are three purposes for a Post-Implementation Review:

- To ascertain the degree of success from the EMIS, in particular, the extent to which it met its objectives, delivered planned levels of benefit, and addressed the specific requirements as originally defined.
- To examine the efficacy of all elements of the working EMIS to see if further improvements can be made to optimise the benefit delivered.
- To learn lessons from this project, lessons which can be used by the team members and by the department of education to improve future project work and solutions, particularly in the area of EMIS.

In some cases, the first of these objectives can be a contractual issue. Where that is the case, it may be safer to run separate reviews - one focused on contractual compliance and the other seeking to derive further benefit from a no-blame review.

There is often a difference of opinion as to who should perform the Post-Implementation Review. Usually, members of the project team will want to complete the review as a natural extension of their responsibility to deliver optimum benefit from the solution. They understand what was required, what was changed, how it was achieved, how things are supposed to work, how to fix problems, etc.

There is a converse argument that the review should be performed by an independent team. This reduces the risk that any errors or omissions of the project team might equally be overlooked in their review.

A solution is to do both. An independent audit team, working in consultation with the EMIS users and project team, could examine whether the results are satisfactory. The project team might then reconvene to consider that input and also to examine how to generate further value from the solution.

8.6.2 What to Consider in a PIR of the EMIS

A list of points should be drawn up to cover all elements of the operational solution. They should include such things as:
Is the EMIS meeting the expectations of users and management?

- Is the required functionality available?
- Are the new EMIS procedures properly documented, published and known about?
- Have users received adequate training and coaching to take advantage of the new EMIS?
- Are staffing levels and skill sets appropriate for the actual workloads?
- Are staff displaying appropriate attitudes to get the best out of the system (confidence in its capabilities, belief in its purpose, willingness to make it work, etc.)?
- How busy, usable, useful and adequate are support services such as the systems support function and help desk?
- Are third parties such as service providers and suppliers satisfied with the service?
- Is the level and nature of identified faults acceptable?
- Are faults handled at an acceptable speed and with satisfactory results?
- Is data integrity of the EMIS being maintained within the system and in relation to other integrated or interfaced systems such as U-DISE?
- Are systems controls being applied correctly?
- Are the department of education procedural and financial controls being applied correctly?
- Does the EMIS and its usage meet current state department of education and state government legal and regulatory requirements?
- Is the EMIS able to process transactions at an adequate speed?
- Does the EMIS have the capacity to deal with the actual peak loadings as encountered and foreseen?
- Are technical staff or the service provider following operational procedures including backup, recovery, security and disaster recovery?
- Has the project been properly demobilised, e.g. documentation filed, team members appraised and reassigned, equipment and facilities returned, final accounting and reporting completed, success and completion communicated?
- Does the EMIS engage school actors?
- Does the EMIS facilitate all aspects of planning? If now which aspects need to be addressed and how?

Are the benefits of the EMIS being realised:

- What were the final costs of the full EMIS?
- What is the actual operating cost of the new EMIS?
- What are the actual benefits being delivered by the new EMIS?
- How does that compare to the original project design put forward in step 3?

Responses to these questions and others should help determine what the Future improvements for the EMIS are likely to be:

- Could further training or coaching of either head teachers, management or other stakeholders improve the degree of benefit being generated?
- Are there further functional improvements or changes that would deliver greater benefit?
- Are specific improvements required in procedures, documentation, support, etc. required or possible?
- What learning points are there for future improvements to the EMIS processes, policies and plans in general that have resulted from implementation of the EMIS?

These questions will typically be investigated through a combination of investigative techniques including interviews, examination of documentation, performance statistics, hands-on tests and checks, and other methods in conjunction with all stakeholders and the responsible unit for EMIS.
within the department of education. Implications and potential remedial options would then be assessed and evaluated. The findings and recommended actions would be prepared, normally in the form of a report or presentation and presented to the SLG for consideration and to inform future developments.

**Goal:** To use and sustain the EMIS

Once the improved EMIS begins producing reports of education information, pay attention to how data are actually used for decision-making. Provide training and support to managers and decision-makers in their efforts to effectively use and analyse the data that the EMIS provides. Throughout the process, emphasize sustainability and continuous improvement of the EMIS through training and building capacity to support, use and improve the system into the future. Continue to ensure the quality of data within the EMIS and evaluate changes to the systems or processes to improve management, planning, monitoring and evaluation of the education sector.

9.1 Overview

As noted previously, a critical success factor for the EMIS is in the continuous training of and support to all staffs to effectively use and operate the system. There are several ways in which support to the systems can be maintained. These include:

1. Ensure Recurrent Training
2. Host an Annual Forum
3. Encourage local (cluster) support groups
4. Establish a support centre
5. Make training modules accessible online
6. Use factors relating to the EMIS in annual staff performance reviews
7. Ensure data is relevant, complete, timely and of high quality
8. Ensure data is used
9. Manage change

Each of these methods is explored in more detail in the sections below.

9.2 Ensure Proper Staff Capacity and Motivation

9.2.1 Recurrent training programs

During the lifespan of an EMIS, key staffs will change position, new recruits will join the department of education and other staffs may leave or retire. It is therefore necessary to develop a recurrent training program to help train staffs on a regular basis in the EMIS.

- Generally all staffs should have refresher training at least once every three years on the EMIS
- New staffs should undergo training on the EMIS when joining the department of education and given responsibility relating to the system.
- Head Teachers and other staffs within the Department of Education should be trained on the forms and procedures relevant to the EMIS and required of all staffs.

Recurrent training should be factored into the annual operational budget for the EMIS unit and/or department of education. Staffs should also be encouraged to use the support forums in place for the EMIS (refer section below).

As noted previously, the use of innovative methods of training and support can help reduce costs for training and also make training more readily accessible to staffs. Methods for deploying training include:

1. Develop clear and interactive training modules and ensure the training modules are accessible online
2. Hosting web seminars. This can be particularly useful for reaching remote and rural offices.

Staffs can be reminded (sometimes through the EMIS) that they should be undertaking online training in the EMIS.

9.2.2 Use factors relating to the EMIS in annual staff performance reviews

Knowledge and use of the EMIS and derived data can form part of the criteria for annual performance review of staffs. Achievements such as having all data under the management of an individual up to date and of high completeness and accuracy can be used during performance assessment. Likewise the degree to which EMIS reports are used in functions such as planning the education system or assessing the impact of policy could also be used during evaluation. This can help ensure that staffs appreciate that the EMIS is an important and relevant tool for the department of education and that management are monitoring interaction with the system. This can also assist in ensuring that decisions which affect education planning are partially based on education data and that the education system and the impact of policies are being properly monitored and evaluated in accordance with international best practice.

9.3 Ensure Ongoing Support to the EMIS

9.3.1 Host an Annual Forum

As previously noted, the EMIS can affect many different stakeholders such as head teachers, NGOs and collectives of private schools. All stakeholders should be annually consulted concerning the EMIS. One method to encourage input from all stakeholders is to host an annual forum to showcase changes to the EMIS and to receive feedback on proposed changes. This is also an opportunity for different groups to voice requests and concerns.

9.3.2 Continue the SLG

The SLG should continue to meet to review the progress, risks and requests for changes to the EMIS. The SLG should meet once or twice a year and review a review of the system. The review should be submitted by the head manager of the EMIS, typically the head of the Planning Unit. Requests for changes or additions should be carefully reviewed, debated and if possible a request for budget made. Wider stakeholder consultation or technical studies may be required and commissioned to investigate or confirm issues.

9.3.3 Encourage local (cluster) support groups

Block and district level support groups to the EMIS should be established. The groups should be encouraged to meet locally throughout the year to discuss issues relating to the EMIS and to mentor on different aspects of education planning using data derived from EMIS. Minutes of meetings should be taken for reference and evaluated as part of the annual review on the EMIS.

9.3.4 Establish a support centre

An online support centre should be established for the EMIS. If the department of education already has an online support centre for other software then this can be adapted to include the EMIS. The support centre should encourage the sharing of questions and responses concerning the EMIS via online chat or forum centres. Training and other support information should be readily available through the support centre. A mediator should be assigned from the EMIS unit to respond to questions and other issues on a daily basis.
9.4 Maintaining the Quality and Completeness of EMIS Data

9.4.1 Keep Data Current

A routine EMIS is updated on a regular basis to record changes in education institutions as they occur, providing an accurate picture of the education system throughout the state. Routinely maintaining and updating the EMIS presents several advantages. Education managers and supervisors can quickly note issues occurring at the local level, such as an increase in the number of out-migration requests or a drop in student enrolment, and can respond to these changes more effectively. Regularly reviewed, up-to-date data improves accuracy over time and enhances policy makers' ability to make informed decisions in order to meet future education care needs. In addition regular updating of data keeps users engaged with the system which ensures the system remains a key and mandatory aspect of Department of Education processes.

Data collection procedures should also be routine and occur on a regular schedule, such as biweekly, monthly or annually, depending on the data being collected. To establish a schedule for data collection, look for and build upon any existing sources of routine data, such as attendance monitoring, Human Resources management processes and student transfers between schools.

At least one person from the Department of Education at the Block level should be tasked with continuously ensuring that all staffs are up to date in maintaining EMIS Data. The Block level data person should monitor all processes and should have access to data quality reports which should highlight gaps in the data and the data that is no longer current and in need of update. Education managers should be held accountable to keep all data up to date. This typically means having a window of time between receiving information on a staffing change and logging it in the system. Such a window is usually three to four weeks.

9.4.2 Undertake Periodic Data Audits

It is a good idea to conduct an annual data audit to identify problem areas in your EMIS and in data collection, entry and management procedures. As part of an audit, you might compare EMIS data to similar data from another source, such as a survey or census, to check for discrepancies. Another way to verify data quality is to check randomly selected electronic records against paper versions of data collection forms. Software logs should provide information on usage and maintenance of the system.

Here are some issues to watch for when conducting the data audit:

- Does the total number of records match the expected number?
- Are any duplicate records found?
- How many records are out of date (for example, has a school been upgraded or closed, but the change has not been recorded)?
- How many key fields are incomplete (such as enrolment data, facilities or financial data)?
- How frequently are records being updated? Are they updated in accordance with routine procedures?
- Are there any invalid user accounts (such as for data entry staff who no longer work on the EMIS)?

A data audit can conducted once per year and can be conducted on a sample set of the EMIS data or on a selected region. The audit can be conducted by an affiliated government unit such as the NIC or can be conducted by an external agent such as an accounting or data quality assurance agent.

The results of the data audit should be distributed to EMIS staffs and used to help assess performance. Action should be taken to rectify any issues.
9.5 Ensure the use of Data Derived from the EMIS in Effective Decision Making

The primary aim of any EMIS should be to promote better use of data to drive effective decision-making. As such, it is important to invest in developing a sustainable process and culture that actively encourages people to engage in dialogue opportunities around Education data and information, and ultimately make effective policy and management decisions.

Even when policy-makers and other key stakeholders have access to extensive information about the education system, it may be difficult to see uses for these data beyond the usual reports previously generated with paper records. All stakeholders should be engaged in understanding how they use data, both individually and organizationally, and what factors are important in their context for using data effectively.

This step of the process focuses on providing opportunities for stakeholders to experience critical decision-making scenarios so they can develop their skills using real data in real-life situations. Stakeholders will understand different models for projecting education development needs into the future as the basis for strategic planning. As noted in this guidelines, one method for doing this involves use of demographic financial modelling (refer section 3.6). At this point, it is often helpful to improve communication among users of data and leverage opportunities for improved data-sharing across different levels of the organization and with other stakeholders.

This will take time and some managers will adapt slowly to the EMIS. Even with data available, it is often challenging to education practitioners and policy-makers to contextualize education data and information for more effective decision making and subsequently for policy formulation and practice. One of the major misconceptions about effective use of education data in decision-making might be summed up as follows: Build or gather data and they will use it. We now have sufficient experience to know that it is not enough to make data available. Education sector leaders need a process in place for analysing reports and information, getting it to the right decision-maker at the right time, and ensuring the power and resources to act on the data. However, if this process is faulty or insufficiently collaborative, then uninformed (and incorrect) decisions may result and can shift focus away from priority issues.

Continuous monitoring of the use of data in analysis, planning, monitoring and reporting is required. Managers should meet on a very regular basis to discuss reports and analysis and share results. The criteria to use EMIS data in all decision making to some degree must be mandated and reinforced.

9.6 Keep the EMIS Relevant and Ensuring Sustainability

An information system requires ongoing support and improvement to ensure maximum utility and sustainability. It must remain relevant and, depending on the context and needs of the country, sustainability strategies include continuous collection of feedback from stakeholders about changing data needs and rolling out improvements that align with those needs. The early involvement of stakeholders with the design and eventual implementation of the EMIS encourages their sense of ownership but this ownership must continue throughout the years of use of the EMIS.

An annual review of the EMIS should be conducted to ensure the EMIS is meeting user expectations, determine any capacity development needs, and whether the EMIS is able to meet the needs of changing Education policies and plans. Conclusions and recommendations of the review should be informed from actions and sources considered in this section of the guidelines (step 5). A report should be presented to the SLG for consideration supported by a costed action plan.
10. Example of State EMIS Madhya Pradesh Education Portal\textsuperscript{10}

10.1 Education Sector

The School Education Department in Madhya Pradesh is one of the largest departments in terms of engagement of human resources in the govt. sector. The School Education sector in MP is the largest sector in terms of beneficiaries, geographical reach, engagement of human resources and establishments in Madhya Pradesh. There are more than 125000 government schools supported by more than 350,000 teachers and support staffs and more than 3800 DDO's. There are more than 1 million students studying in government schools.

According to the census reports released in the year 2010, Madhya Pradesh has achieved a literacy rate of 64.11%. Therefore, Madhya Pradesh stands very close to the country’s literacy rate which is 64.8% as per the census reports of 2010. Like in most other states across India, Madhya Pradesh also follows the 10+2+3 tier of education. There is government as well as private education institutes across this Central Indian state. Hindi is the preferred medium of instruction in the government monitored schools and colleges of Madhya Pradesh. English is used as the language of communication between students and teachers in private institutes.

The educational challenge in Madhya Pradesh has been to universalize the provisioning of basic schooling and to help ensure quality education in schools. Madhya Pradesh has attempted to address quality through the development of the capacity of teachers, students and education managers. The strategic planning for this is placed within a policy of decentralized participatory governance coupled with the use of modern technology resources, especially information and communication technology.

In Madhya Pradesh, Information and Communication Technologies (ICT) are transforming not only education but also the governance of schools, finances and providing online facilities to the clientele. Teachers, students, educational managers and public representatives have access to more information, more ways to interact, collaborate and more approaches to take decisions based on support systems. In the education sector, ICT is being used for improving the achievement levels of students, teacher training, monitoring of educational activities, maintaining a database of educational indicators, provision of a series of online facilities and better financial support system. All these initiatives directly or indirectly are assisting in maintaining the quality of education.

In Madhya Pradesh, the use of ICT in education rests on the belief that on-line governance should not only improve the internal communication system but even more importantly improve the way government agencies interact with and relate to other government agencies (G2G) and governments relate to their citizens (G2C). In this perspective, the objectives of the use of ICT in the education sector are to:

- Improve the content and process of education by improving the capacity of students and teachers i.e. improving the quality of services delivered by the department to the community
- Improve information base for instant internal communication
- Develop capacity among educational personnel and teachers to be able to synthesize their understanding of academic and managerial issues

\textsuperscript{10} This section draws heavily on “Madhya Pradesh Education Portal, A Case Study with Details for Replication” (CIPS 2013) as well as field work and research undertaken by RMSA TCA technical staff.
Madhya Pradesh State strongly believes that ICTs can yield significant outcomes in improving the quality of education and bring paradigm changes in the quality of services required by the clientele and thereby bringing excellence in the education system. The Education Portal highlights the State’s initiatives and commitment for use of ICT in good governance in the education sector.

10.2 About the Education Portal

The Rajya Shiksha Kendra (RSK) in collaboration with NIC, Bhopal has developed a sophisticated EMIS for education administration and management consisting of a suite of online applications for School Education and Tribal Development departments. The portal provides not only a common platform for interaction and information sharing for all school employees related to school education, but is also serving as a platform for dissemination of information, taking decisions based on support systems and exchange of ideas.

The Education Portal contains information on all the schools throughout Madhya Pradesh. The Education Portal is designed in technical collaboration with National Informatics Centre (NIC) located in Bhopal, Madhya Pradesh. The Education Portal is accessible to all stakeholders of the state Education System including students, teachers, citizens and educational managers. The system is primarily accessed by teachers and field level functionaries of the School Education and Tribal Development departments. The Education Portal stores, manages and reports on information related to school infrastructure, finance, civil works, various pedagogical indices, personnel and general administration of the Education Sector.

Madhya Pradesh report that the portal has proved to be very useful in bringing qualitative and credible information instantly for the decision makers. The portal uses DISE code numbers to help identify each school, however the codes have been made permanent for each school, rather than temporary. All the teaching, ministerial and administrative staff members have been allocated Unique Identification codes (UID) within the system. Using the DISE codes and UIDs, the user can retrieve information concerning schools, teachers and students.

The system helps facilitate a range of regular functions including, preparation of pay-bills, salary slips, managing the provident fund, seniority, student achievement indices, personalised follow-up and tracking of assistance provided to Children With Special Needs (CWSN), Monitoring of civil works, departmental circulars, redressing employee’s grievances, enrolment and personalized follow-up and tracking of out-of School Children and their mainstreaming. Teachers’ full e-Service books are stored in the system and the system manages online transfer of employees, writing and maintaining ACRs and other functions relating to staff management. The portal has facilitated timely payment of salaries to staff, effective and efficient use of manpower resources, transparency in all operations & decisions and has provided facility for social audit of all its major activities and functions. The EMIS also manages the electronic transfer of funds to and from schools.

Satellite communication technology (Edusat) is used for the training of teachers and monitoring of SSA related activities through regular video conferencing programmes up to district and block levels. Through Edusat, the State has been able to disseminate training and information rapidly and cost effectively resulting in substantial savings in time, resources and funds in the implementation and operation of the Education Portal.

10.3 Stake Holders and Beneficiaries

The major stakeholders and beneficiaries of the project are:

- More than 350,000 teachers and support staff of education sector
• More than 16 million students studying in government schools
• More than 125000 government schools
• Officers and Staff of State level offices (RSK, CPI, TWD etc.)
• 3800 Drawing and Disbursing Officers (DDOs) and their accounts staff
• 50 District Education Officers, District Project Officers, AC (Tribal), 318 BEOs, and 322 BRCs
• More than 10,000 Supervisory Functionaries Sankul and JSK level

10.4 Major Challenges before Implementing the Education Portal

The major challenges which the implementation of the Education Portal sought to address included:

• Huge number of teachers, staff, students and educational institutions, involvement of multiple departments and agencies resulting in problems related to collection, processing and dissemination of data and information at different levels
• Non-availability of updated and accurate database of various core entities of the education system like Schools, Teachers, Supporting Staff, Students, civil works etc.
• Non-availability of effective and accurate system for the monitoring of schools, teachers and other resources
• Non-availability of a single unified mechanism and platform for communication and information sharing amongst various stake-holders of the system i.e. authorities, teachers, students and parents
• Non-availability of a suitable decision support system for:
  o Human Resource Management and financial management
  o Rationalization of the staff for ensuring proper Pupil-Teacher Ratio (PTR) in schools
  o Rationalization of transfers by shifting excessive staff to the understaffed schools
  o Generation of the requirements of new teachers and staff
  o Rationalization of creation of facilities i.e. teachers and classrooms based on updated information
  o Checking/Controlling unauthorized transfers, attachments and fake appointments
• Unauthorized shifting and transfers of teachers resulting into surplus strength of teachers in schools located in urban and well connected places and schools located in rural areas do not have teachers
• Delay in payment of salaries to teachers due to multiplicity of the payment authorities. The delay is more in case of the contract teachers as there is no monitoring.
• Unknown number of Out of School Children (OOSC) with no means to track those children.

10.5 Objectives of the Education Portal

The Education Portal has been designed with the following objectives:

• To facilitate a Common Platform for School Education related Issues, Subjects & Application Software and Single Source of Authentic and Live Information for all stakeholders like Departments, Schools, Teachers, Staff, Students, Parents, Citizen, school Administration and Management, Planners
• Facilitating a comprehensive MIS to the Government for monitoring and analysis.
• Increase the overall productivity and efficiency of the system
• Facilitate Social audit by the dissemination of all possible details of various activities of the department.
• Tracking of the performance of students and their drop-out status.
• Minimization of the manual work at various office levels.
10.6 Features of the Portal

The education portal has the following general features:

- Online system web enabled
- Based on education department Work-Flow systems
- Automates required business Processes
- Role and Authority based
- Single sign on facility for accessing various role based applications being designed for the school education department to be used by designated authorities at State, District, Block and schools levels
- The user is allowed to use of various modules and its functions as per the Role & Authorization.
- Role can be Admin, Approver, Data Entry
- Authorities – State Admin, DDO, DEO, DPC, BEO, BRC, Public, teacher etc.
- Scalable architecture to accommodate more applications and users
- Flexibility of adding more Roles, Authorities as per the requirement
- Dynamic and Database driven - Captures transactions, all reports and queries are dynamically calculated and displayed on the fly.
- 24X7 Accessibility from anywhere - Web-based, online system - can be accessed from any PC using a browser and internet.
- Each and every transaction/operation is logged
- All kinds of usage reports and statistics are available on the fly
- Hindi support using Unicode and intuitive interface – The application has been designed by following Unicode standards and has support for all languages including Hindi. It contains ample of help on each page to facilitate the user.
- **Zero Deployment cost** – The application is a browser based application and can be run from Linux/Windows, **Zero Deployment cost**. No need to purchase and install costly hardware and software licenses for using/running the application at various locations.
- Access to the system is user specific and is based on a secure login access
- Salaries and payments of all employees to be processed using the online payroll ensure continuous updation of the database of the schools, teachers and staff.
- Order issued by Finance department to Treasury Officers to accept the pay-bills generated using the online payroll system.
- Live Relational Database of Core Entities and Layers of education system and their mappings including coding for: Districts; Blocks; DDOs; Office and School Types; JSKs; Schools and Offices; Designations; Teachers/Staff; Civil works
- Codification of various entities, schools have been given 11 digit code numbers, teachers 6 digit and the DDOs are using the DDO code numbers given by the Finance department.
- Focus on capturing the basic transactions of the process Generate of all desired reports on the fly & Eliminate Repetitive processes
- All sub systems (modules) draw data from a common database of various entities like school code, employee code, work code, JSK Code, School category, Teacher –school linking
- User Manual covering the functionality of the applications
- Continuous monitoring of the officers, districts, blocks who do not use the system.
10.7 Legislative and Policy Environment

As part of national Compliance, Madhya Pradesh have issued guidelines and letters to district officials regarding the implementation of UDISE data standards and also have legislation and policies supporting the use of the Education Portal. However there is reportedly no penalty for misinterpretation and misreporting of data and therefore there is no accountability mechanism in case if data is not submitted in time or misreported. There are no penalties introduced for delays taking into account various factors such as: poor infrastructure, human resources, lack of capacity, internet connectivity and accessibility in remote districts. School principals provide data but reportedly do not feel accountable for any errors/discrepancy in data capturing and entry. Data entry operators are not using the data and hence they do not have any ownership (third parties) and some respondents expressed that some of the mistakes could be avoided at data entry level (RMSA TCA 2014). There is scope to consider establishing mechanisms for imposing penalties at all levels for misreporting, misinterpretation and delay in data submission. A good example of an EMIS policy document is included in Annex 4 of these guidelines.

10.8 Child and Family Tracking System – Samagra Samaji Suraksha Mission (SSSM)

Samagra Samaji Suraksha Mission (SSSM), is a system developed by the state government of Madhya Pradesh for the purpose of tracking family and individuals. Samagra Samaji Suraksha Mission (SSSM) is often referred to as Samagra, MP Social Security Mission, or as Child Tracking, Integrated Scholarships and Benefits Management System. Samagra is part of a broader scheme of the Madhya Government, and was envisioned through a Government Resolution in the year 2010. The National Informatics Centre (NIC) has developed the system.

The system cater to different needs of children including Out Of School Children (OOSC) and children with special needs. Samagra has an aim to track a child from birth to higher education, job and then after, to ensure that the child gets due care and support throughout his / her school education years. This portal has integrated various 30 schemes from 9 government departments and most importantly, it is available with a few basic information about that child.

Through Samagra, the Department of Social Justice in Madhya Pradesh has undertaken a massive exercise of collecting complete information pertaining to every household in MP through surveys. At present information pertaining to 8 crore (80 million) families is registered in the portal. The portal also carries information about 1.6 crores (16 million) children as well.

Through Samagra the Government of Madhya Pradesh P is seeking to provide Citizen Centric Services to all the citizens of MP. Samagra aims to provide a Unique Family ID to each family and further a unique ID to every member of the family for recording information about every household and the members therein. All citizen centric services spanning the entire life cycle of an individual from birth, education, job, marriage, health, pension and death are sought to be monitored and controlled and disseminated through this portal.

Since Samagra has been created to serve a broader mission of covering all the citizen centric services throughout the lifecycle of an individual – there are several sub-portals created within Samagra to cater to different needs of citizens along the life cycle. One such is the Samagra Shiksha Portal or the Samagra Education Portal.
The aim of the Samagra Education Portal is to track every child in the state and ensure that the child gets due care and support throughout his or her school years. This portal is basically a Child Tracking and Integrated Scholarship and Benefits Management System. Through this portal, information pertaining to 30 schemes of the government are administered through nine government departments and are available under a single umbrella. For instance if a Scheduled caste parent wants to find out which Government schemes by way of scholarships and financial and other forms of assistance is available for his or her child they can log into this portal and after a few simple clicks the information will be made available.

Furthermore the Samagra Shiksha Portal has detailed information of every child in the state. Through this all forms of scholarships available all assistance schemes available can be tracked and monitored. It has information on Enrolments, Details of CWSN students, Out of school children are all available. DISE Code and Samagram code have been linked to locate every child and map them to the school (1.6 Crore or 16 million children linked in this manner)

The Portal is now working on the next step to link every student with their respective teacher and that teacher will become mentor of those students. A link will be established with Madhya Pradesh Education portal where teachers’ information is available and then will be mapped with students’ profile. Addition to this, by the year end cluster coordinators will be allowed to feed result of each students. Higher education has developed a system where students on scholarships are being tracked and Samagra ID has been made compulsory for applying scholarship, therefore, provision can be made to track them in future. However, it is not linked with Samagra Shiksha at present. Samagra Shiksha is also planning to include children (aged 3-5 years) registered under Anganwadi for Mid-Day Milk schemes.

Thus the Samagra Shiksha Portal is gradually being integrated with the Education Portal to create a single and effective Child Tracking System. Hereafter the system will be referred to under the Education Portal.

10.9 Sub Systems (Modules) of the Education Portal

10.9.1 Overview

The education portal is comprised of many modules or sub-systems which are partially integrated and based upon common data standards so as to enable comparison of data between different sub systems when required. A more complete list of sub systems (modules) and functions is detailed in Annex 2 of this document. The main sub systems include:

a) Online Payroll and Human Resource Management Application
b) Civil Works.
c) Online Monitoring of Learning Enhancement Programme: (LEP)
d) Online Database of Children with Special Needs
e) Online database of Out Of School Children (OOSC):
f) Online monitoring and follow-up of Inspections
g) Content Management System of Portal by facilitating the upload of Information

Each sub system is briefly described below.

10.9.2 Online Payroll and Human Resource Management Application

This sub-system has been designed to manage all employees belonging to Education and Tribal Welfare department and are working for Education sector (presently 350,000+ staffs). Use of the online Pay Bill generated from this software has been made mandatory by the Finance Department
for submission to Treasuries for clearance. Monthly use of online pay roll system involving schools, teachers and staff ensures the monthly and live updating of the databases.

This sub system also facilitates various HR functions like transfers and generation of pay bills and various related schedules and bank advices. The system is being actively used by 4018 DDOs, 48 District Education Officers, 313 Block Education Officers, 48 DPCs, 313 BRCs.

10.9.3 Civil Works

Civil works is a major component of SSA. Almost 40% of annual budget of SSA is used for construction of new school buildings, up-gradation of existing school buildings and providing additional rooms for schools. During the year 2009-10, the State Education Department reported that a sum of Rs. 800 million RS. Had been made available for constructing 40,756 school buildings. Most of these school buildings were to be constructed in far-flung, hilly and remote locations.

At the State level, it is very difficult to monitor progress of civil works. In order to check the progress of buildings, four categories have been created: complete, in-progress, held-up and not started. The portal maintains details of all the sanctioned civil works in the district. The district enters monthly progress and inspection notes for each works. The sub system provides various reports on all or any of the above categories at block, district and State level. These entries help to effectively monitor the progress of all the ongoing works. Progress reports are uploaded by districts. The software also has facility to upload digital photographs of the works. Different stages of completion of the building and information on relevant administrative and financial sanctions and completion certificates is also available on the portal. All the detailed information on civil works including the photographs of all the civil-works shall be made online for general public for scrutiny, social audit and to facilitate introduction of transparency in government functions.

10.9.4 Online Monitoring of Learning Enhancement Programme: (LEP) (Dakshta Samvardhan Karyakram)

In order to bring quality in the teaching-learning process, the State govt. has implemented a Learning Enhancement Programme commonly known as Dakshta Samvardhan Karyakram. The main objectives of this programme are to ensure that:

- Students are able to read and write by the end of academic year 2008-09
- Students achieve expected literacy and numeric skills and competencies
- Students develop reading habits and become independent readers
- An effective monitoring system to focus on quality classroom transaction and pupils' achievement on a continuous basis is established

The monitoring of this programme is done at four levels viz; school, block, district and State level. The school level weekly monitoring is by the School's Head Master and incorporates performance of students and teachers. The block level monitoring is at the cluster level and is done by the Block Education Officer, Block Resource Centre Coordinators, Block Academic Coordinators, Cluster Academic Coordinators and resource persons. At district level monitoring is done by the District Education Officer, District Project Coordinator, and Assistant Project Coordinator and DIET faculty. At State level monitoring is done by RSK-OICs and other State level officers. In order to closely follow progress made by students and teachers responsible for their progress, the portal provides facilities for school wise and competency level wise entries. The entries are made at the block level. The Portal also provides facilities for school and class-wise monitoring of achievement levels of children in different schools subjects in a progressive mode.
The sub system has provision for monitoring of learning achievement of students in each subject during a particular month. Thus, based on subject and designated teachers, schools can be monitored and tracked for successes and failures to achieve the targets. Similarly, excellent and poor performing districts and schools can be monitored. Teachers who are performing well and who are not can also be monitored. The facility has provided pendency, discrepancy and performance analysis of LEP. The information is available in the public domain for the use of public representatives, parents and anyone interested in education.

10.9.5 Online Database of Children with Special Needs

The Sub system to manage children with special needs has been developed. The database gives category wise and district wise details of children enrolled in this category. Distribution of special equipment, training of teachers and work done by mobile resource persons is available on the portal. CWSN related projects undertaken under SSA are regularly monitored through the portal.

10.9.6 Online database of Out Of School Children (OOSC):

The application facilitates registration of OOS Children with their profile to create a centralized database of children. Monthly updation of the efforts being made by the concerned for the follow-up and mainstreaming of the child is also facilitated.

10.9.7 Online monitoring and follow-up of Inspections

An online sub system to facilitate inspections has been developed:

- All inspecting officers can enter the details of the inspections carried out by them
- The problems related to absent teachers, short attendance, textbook related problems reported by the inspector are made available to the concerned authority for necessary follow-up action.
- State-level/district-level/block level and school level analysis and monitoring of various types of issues/problems and follow up action taken by the concerned authority.

10.9.8 Content Management System of Portal by facilitating the upload of Information

The system has been designed and developed to provide a common platform for various departments and agencies working for school education. The portal facilities facility to upload department and category-wise

- Orders
- News
- Training courses and event announcements
- News clippings related to school education
- Tenders
- Forms, Schemes, Procedures

All concerned officers of CPI, TWD and RSK can contribute and upload documents to the portal for dissemination to all.

10.10 Implementation Strategy contributing to Success

10.10.1 Using a Professional Agency experienced in E-Government Solutions

A major requirement for the rolling out the Education Portal was to use an in-house professional agency to design, implement, host and monitor the usage of the Education Portal. The agency was
also required to offer ongoing maintenance to the system. The agency was also required to understand the requirements, the challenges and be able to make improvements and changes as required. The National Informatics Centre (NIC) Madhya Pradesh was selected. As a result the handling of technical issues, formulating of solutions, design, development and maintenance of software and databases are undertaken by the NIC officers.

10.10.2 Ensuring all Stakeholders at all levels were Informed and Supported
The implementation and rollout of the Education Portal involved all departments. Each department selected focal officers who were assigned to one or more sub systems. A team of Rajya Shiksha Kendra officers were responsible for management and coordination of implementation and training. Programmers and MIS officers were posted at district and block levels to give support to focal officers and to coordinate efforts.

As noted in these guidelines, it was essential to the success of the implementation to have all stakeholders in agreement and understanding the objectives of the undertaking. This was ensured by a circulation of joint instructions by the Heads of Department and the Principal Secretaries of concerned departments. The Chief Secretary also issued instructions in order to ensure cooperation from District Collectors and CEOs of zila panchayats.

10.10.3 Ensuring key stakeholders Informed Design and Management
Further, a multi-departmental team was constituted for project management and comprised of the Commissioner of Rajya Shiksha Kendra, Commissioner of Public Instruction, Commissioner of Tribal Development, NIC representative at state level. A project management team was constituted at district level and consisted of the Assistant Commissioner for Tribal Welfare and Programmer, Sarva Shiksha Abhiyan. Both the key management teams met regularly to assess the performance of the implementation and address the shortfalls and bottlenecks.

10.11 Challenges Encountered during Implementation

10.11.1 A rigid administrative apparatus
**Challenge:** Penetrating into traditional bureaucratic apparatus of the departments of state government was a major roadblock that confronted implementing agencies. At the tie of initiation of the project, NIC's efforts were resisted by the IT divisions of key departments. Securing their active support and cooperation of the concerned authorities was a significant challenge. The attitude was attributed to the discomfort associated with a gradual shift from a closed and siloed flow of information to a system in which information is shared and easily accessible by all stakeholders.

**Solution:** Securing high level support of the Permanent Secretary was paramount to the success of the implementation. The involvement of key stakeholders in the working group helped overcome barriers and resistance.

10.11.2 Unavailability of reliable information
**Challenge:** Integrating the voluminous data generated by the education department was a significant challenge when commencing the system. Each department had generated enormous amounts of information in the form of monthly, quarterly and annual reports including progress reports on students, teachers, schools, profiles of OOSC and CWSN, enrolment statistics, government orders relating to appointments, transfers and other matters. Moreover this data was compiled at the cluster, block, district and state level.
**Solution:** In most cases it was less complex to undertake a complete baseline survey. In the case of staff the survey was confirmed against service records to ensure data was accurate.

### 10.11.3 Low Capacity of government officials

**Challenge:** The implementation of the Education Portal meant that in many cases, officers had to transition from a paper based system to an electronic system. Many officials had limited experience of working with technology and had to have skills developed.

**Solution:** NIC organised trainings sessions and workshops all levels of government and encouraged a conductive environment for the sharing of skills and experiences. Continuous remote training and support was undertaken during and after the implementation and is ongoing.

### 10.11.4 Ensuring effective communication with all Stakeholders

**Challenge:** The State Education Department of Madhya Pradesh involves the active participation of a large number of stakeholders operating at multiple levels. It was important to ensure that all stakeholders were involved at all phases of the project and understood the objectives and path to achieving those objectives.

**Solution:** The inclusion of key stakeholders in a working group helped facilitate communication. Regular status updates and notices were posted on the Education Portal website which helped ensure stakeholders were informed as to the progress and objectives of the implementation.

### 10.12 Technology Employed

The following table lists the technology that was used to develop and maintain the system. Microsoft database software and operating systems were the main cost items that were procured as once only procurements.

<table>
<thead>
<tr>
<th>Name of Software</th>
<th>Licencing requirements</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft.Net Framework 4.0 using ASP.NET and C#</td>
<td>Freeware</td>
<td>Development of Front End software</td>
</tr>
<tr>
<td>JQUERY</td>
<td>Open Source</td>
<td>Java script framework for front end</td>
</tr>
<tr>
<td>SQL Server 2008</td>
<td>Proprietary (one off purchase)</td>
<td>Database back end</td>
</tr>
<tr>
<td>PostgreSQL 9.0</td>
<td>Open Source</td>
<td>Database querying</td>
</tr>
<tr>
<td>Microsoft SQL Server Reporting Services</td>
<td>Proprietary (one off purchase)</td>
<td>Reporting and analysis tool</td>
</tr>
<tr>
<td>Windows Server</td>
<td>Proprietary (one off purchase)</td>
<td>Hosting the system</td>
</tr>
</tbody>
</table>

### 10.13 Education Portal and its links with UDISE

U-DISE is mandated as an annual data collection activity by the national Ministry of Education under NUEPA. As such Madhya Pradesh comply with the requirement annually. However owing to the individual child data available under Samagra Shiksha Portal and the individual teacher data available through the Education Portal HRIS, Madhya Pradesh already has very accurate data available on the education system prior to annually collecting data through U-DISE. Owing to the complexities of the U-DISE form, data is often not completed accurately and it takes time to reconcile figures against those in the Education Portal and Samagra Shiksha Portal.
In the future U-DISE data will be able to be populated from the Education Portal far more effectively and accurately than via the census. The census forms may still be printed containing the data from the education portal and sent to schools for annual verification of data however there are better methods of verification which could be used to verify the data in the education portal throughout the year as noted below.

**Figure 7. Simplifying U-DISE in Madhya Pradesh**

Other issues which pertain to UDISE and its relationship with the Education Portal include:

The lack of stability in the UDISE coding system which is linked to the geographical location of the school and hence subject to change. In response Madhya Pradesh have fixed the code of each school to be permanent regardless of change in the geographic location of the school.

The storage of individual teacher data in UDISE has no proper coding system and repeats data for the entire year in a separate database for each year. Thus the database is not properly relational and cannot be easily examined or queried. In response MP is planning to export their data into UDISE as indicated above. In addition MP store their own employee code in UDISE to help identify each staff member.

The 5% verification exercise is of limited use as it is only ever used to correct 5% of schools and neither penalties for false or incomplete data nor calibration of results to the block level if employed. Thus it would take 20 years to cycle through all schools to correct data. The resources used for the verification exercise would be best applied elsewhere such as strengthening inspectorate or supervisors’ capacity to verify data continuously throughout the year. A shift towards obtaining data from state operated operational systems such as the education portal help verify data by controls implemented in each operational system and through the nature of obtaining aggregate data from individual records of pupils and teachers. Inspectors and supervisors can be utilised to verify school data throughout the year by taking a report derived from U-DISE/education portal to schools and verifying data against school records and physical headcounts as part of the process of school supervision. Reports can be built into U-DISE to identify bad data which exceeds pre-defined thresholds or which changes radically.
year to year. These processes and techniques would be more effective than the present 5% verification process.

Madhya Pradesh State Department of Education aim to address all issues over time.

10.14 The Benefits of the Education Portal

10.14.1 Overview

Madhya Pradesh Education Portal is comprehensively automating and re-engineering various processes and functions related to the governance of the state’s school education system. The portal has web-based interfaces for various applications. All 350,000 employees are registered users. The portal maintains their full profile and service record including designation, school/office and work description. It allows concerned employees to access the portal from anywhere (home, cafe, work) provided the computer has an internet connection.

Through the Education portal Madhya Pradesh has been able to develop a transparent working environment where all practitioners are better informed and able to make decisions based on quality, timely and complete education data. This is helping to ensure that all children in Madhya Pradesh have access to quality education to help ensure their wellbeing in the future.

10.14.2 Holistic integration of diverse stakeholders

Coordinating, strengthening and monitoring the operations of large number of diverse stakeholders involved in the functioning of the school education sector is a large task, especially in the context of large states such as Madhya Pradesh. The Education Portal addresses this challenge in a coherent manner by effectively combining the various technologies for creating a single point of access for detailed real time information required for management, administration, planning, monitoring and evaluation of the education sector. The portal includes all 350,000 staffs, 11 million students and 115,000 schools located in more than 80,000 remote habitations throughout the state. It acts as a one stop platform for interoperability amongst multiple stakeholders including government agencies/departments, teachers, students, parents and has put in place standardised procedures for education related information collation, dissemination and monitoring. The Education Portal is a powerful tool to help insure coherent and smooth functioning of government departments and helps achieve optimal utilisation of resources.

10.14.3 Creation of a transparent working environment at all levels of Madhya Pradesh’s school education system

The education portal is creating significant improvements in the degree of efficiency and timeliness of various activities of the school education sector in Madhya Pradesh. The Portals various sub systems are designed to suit the needs of groups and individual staffs. The Education Portal has made government more transparent and less cumbersome as a result and has strengthened inter-organisational communication.

10.14.3.1 Effect on Human Resource Management

The portal facilitates the complete management of all government teachers and staff throughout the state through a comprehensive and integrated HRIS. The system ensures timely payment of teacher and staff salaries, and ensures transparency in the payment of salaries, assists in proactively addressing all entitlements, prompt redressing of grievances and adherence to government norms.
The system has accelerated the payment of salaries and other allowances from 10 days prior to implementation of the system to just half an hour. The new system facilitates timely generation and payment of correct salary bills and the correct and timely fixation of increments based on the tracking of performance of each teacher in relation to the academic performance of students being taught by him or her.

Accurate and real time details about availability of teachers and their postings, transfers, absenteeism’s and other details is available through the system. The sub-system is used to calculate teacher flow rates through the system and plan for retirements and leaves. The sub-system assists with deploying an adequate number of teachers across all schools. The system of online management of transfers ensures strict compliance to government policies and instructions on transfers. Attachments are scanned copies of all government orders and instructions and are available online. As a result, significant improvements in the performance and teachers have resulted in more efficient and effective use of human resources.

10.14.3.2 Assessment of Academic Performance

The student tracking system is one of the first initiatives in India to provide an online system to help monitor student academic achievement levels in all government schools throughout the state. The portals can report on individual student, class wise and school wise achievement levels and can disaggregate by gender, disability, caste, ethnicity and other factors. This data is collected against common standard assessment criteria which links a teacher’s growth to his or her student’s performance. The system has the provisions for the tracking of monthly assessments and performance of all children based on which appropriate academic and staffing support is provided to schools or teachers whose students are performing poorly.

The performance monitoring of students has resulted in improved outcomes among students as reflected in the Annual Status of Education Reports which show that school children in Madhya Pradesh are outperforming their counterparts in other states of India.

10.14.3.3 Tracking the progress of civil works

The portal enables the monitoring of the entire life cycle of various school related civil works. The system tracks the sanction, registration, monthly progress and revision of technical achievement and financial disbursement. The system has helped identify incomplete works, sped up the process of civil works and has limited the misappropriation of funds. The system has significantly increased the transparency of the conduct of civil works throughout the state.

10.14.3.4 Financial Monitoring

The portal also has enabled transparency and rapid feedback in the management of school finances and accounts. The bank account details of more than 130,000 agencies are maintained through the portal. The portal facilitates the generation of online fund release orders by analysing available data with regards to enrolment, number of teachers, classrooms and the status of funds transferred earlier. The orders are available on the public domain which makes it possible to cross check if the funds have been adequately distributed correctly and utilised efficiently. Prior to the implementation of the Education Portal, teachers and other staffs were not aware of the amount of funds that institutions received and spent but now with the ready availability of the information online they are able to have input into the utilisation of funds for their schools growth.

10.14.3.5 Overall monitoring of schools

The Education Portal facilitates the day to day operations of schools and addresses the different needs of teachers, students and school administration. In doing so the Education Portal becomes an
invaluable tool in the inspection process. The Education portal facilitates over 50,000 school inspections annually. The Education Portal records, monitors and analyses data from inspections and highlights important issues such as the availability of teachers, students attendance, availability and quality of basic facilities in schools and the implementation of various government assistance programs. Prior to the portal, monitoring and follow up on inspection reports at the state and district level was very difficult as there was no method to help ensure that inspections were conducted regularly, correctly followed up on and that action was taken. With the implementation of the Education Portal, inspections and their actions are monitored at every level of the education system. Each inspection report has to be uploaded online along with details of any corrective action required to be taken. Such online monitoring has helped ensure that inspection officials and other stakeholders undertake and follow up on inspections.

10.14.4 Provision of Inclusive Education

The portal is facilitating the provision of education facilities in the remotest regions of the state by making school education inclusive through extension of education opportunities to disadvantaged and marginalised students.

10.14.4.1 Geographic Accessibility

The portal facilitates analysis of the education data collected through household survey conducted throughout the state. This helps identify age and category wise enrolment of students, and identify areas and groups in which out of school children numbers are high and socio-economic opportunities are low. The online analysis helps ensure that easy availability of data can be used to help inform the allocation of resources such as school construction and help ensure facilities are allocated to remote and underprivileged areas of the state.

10.14.4.2 Out of school children

The Education portal automates various processes associated with child enrolment and truancy including registration and follow up on student performance. This is helping to mainstream a large number of out of school children into the education system and has helped significantly reduce the number of Out Of School Children (OOSC) from 231,000 to under 70,000. The portal has significantly improved the tracking of funds allocated for increasing the enrolment of OOSC and has increased the transparency in the conduct of interventions to help enrol OOSC in schools.

10.14.4.3 Children with Special Needs

The portal contains details of more than 100,000 children with special needs. It facilitates the online tracking of medical examinations, facilities for children with special needs and assistance being provided to children with special needs. The Education Portal produces analytical reports to help assess the performance of various government sponsored schools for children with disabilities. The easy availability of this type of information has helped in providing targeted needs based interventions to children with special needs and helps ensure these children are integrated into the education system and provided with adequate facilities.

10.14.5 Facilitating the monitoring and evaluation of key education related national and state level government schemes and policies

10.14.5.1 Effective Implementation of the RTE Act 2009

The Education Portal has facilitated compliance with the RTE Act which was a major step in providing access to education from the age groups six to fourteen throughout the state. The Education Portal
has been a key mechanism in the monitoring and evaluation of progress towards objectives outlined in the Act. The Portal facilitates identification of shortfalls and successes towards RTE provisions including attendance of teachers, enrolment of students, location of schools and the provision of adequate infrastructure and other facilities for schools. The easy identification of such crucial details helped the government of Madhya Pradesh to meet the March 2013 deadline for successful implementation of RTE.

10.14.5.2 Effective Management of Several State Government Sponsored Student Benefit Schemes

An inbuilt workflow system of the portal enables online processing of various benefit/scholarship schemes for students belonging to Scheduled Castes, Scheduled Tribes, Underprivileged Castes and Communities. The centralised database contains relevant details like school-wise, class-wise, category wise enrolment of students and is therefore able to help ensure efficient disbursement of benefits of schemes to these groups. Schemes such as provision of textbooks, uniforms and bicycle distribution have been monitored using the Education Portal. The portal has helped identify delays, ensure correct allocation of funds and identify shortfalls due to unviability of proper details concerning students. This has improved utilization of funds for disadvantaged and marginalised groups and has helped Madhya Pradesh to address the diverse needs of the complex school education system.

10.15 Financial Model

The Madhya Pradesh State Education Portal has been developed and is maintained by utilizing existing infrastructure, human resources and funds in the annual outlay for the Department of School Education. The annual budget for management of the education sector in Madhya Pradesh is nearly 80,000 Million RS. The software’s used for development of the portal are used for other e-government solutions and are already licenced by NIC for other projects and therefore did not incur cost for procurement. According to the NIC, Madhya Pradesh, the Education Portal has been developed in-house as a state service and therefore, no expenditure has been made for software development. Madhya Pradesh already had suitable hardware at all levels of government and internet connectivity is provided to all offices and schools as part of a state wide initiative to connect all government institutions and offices. Good internet connectivity facilitates many government processes. Because the application is web enabled, computers do not need to be powerful to access and use the system. Older computers and handheld devices can easily access the system.

The application is a role based one and all agents perform their functions online rather than paper based. Therefore no additional staff resources are required. The portal has resulted in significant time saved on the storing and retrieval of data and has enabled more time to be spent on data analysis and utilisation. The intrinsic benefits of this are hard to assess but Madhya Pradesh report the savings are likely in the 10s of millions or RS. Existing infrastructure in the form of offices and schools is being utilized for the system.

As noted training and support has been conducted remotely using video conferencing thus enabling training at high volume and frequency and as required and at almost no cost. Staff time has been devoted to learning to use the portal and to migrating data to the system. There was no additional cost involved to the Education Department as employees undertook training and data migration as part of their standard working procedures.

Therefore the Education Portal is fully sustainable with no additional costs and is attested to have substantially improved efficiency and effectiveness of spending.
10.16 Potential for Replication in Other States of India

The vast potential for creating large scale social impact, the high degree of usability of the Education Portal and its capacity to address a range of education planning, monitoring, evaluation and management needs, make it a model worth replicating. The Education Portal is a good example of an EMIS that engages users at all levels of government continuously throughout the year and supports EMIS data use in many processes. The Portal has strong support from stakeholders at all levels and streamlines their functions in a convenient, timely and effective manner. The portal ultimately contributes strongly to the efficiency, effectiveness and inclusiveness of the education system resulting in better education for children throughout the state.

The Education Portal, as it was implemented in Madhya Pradesh, incurred no additional cost on the state. The entire portal is accessible via low end computers and portable devices with internet connections, via web browsers. The Education Portal is supported through the State NIC which is active in all states of India. The Education Portal has been tested, made operational and institutionalised in an Indian State. The Education Portal is being continuously developed over time and thus will improve further in the future. The Portal directly addresses India State Education Policy and Planning requirements through provision of secure, timely, accurate, detailed and complete education data with individual institution, student and teacher data.

Therefore the Madhya Pradesh Education Portal is likely an excellent tool to implement in other states of India. The Portal can support national and state policies such as RTE, SSA and RMSA. The successful implementation of the Education Portal in other states will be dependent on and encourage the integration and coordination of a diverse range of stakeholders over time, adequate computer infrastructure and internet connectivity, appropriate awareness for good education planning and management and strong and aware education leadership.

10.17 Issues for Future Consideration

The Education Portal is an exciting development in India and as with all Systems there is scope for further development. This includes but is not limited to:

- Developing a model of teacher assessment based on class performance has risks. Teachers and schools may focus only on students who achieve well and discourage those who perform poorly. Madhya Pradesh has made efforts to also ensure inclusive education which helps.
- There is scope to further develop the HRIS to be more staff centric. A good model of a staff centric HRIS is Karnataka. More information is contained in the Guidelines for development of Human Resource Information Systems (HRIS) (RMSA TCA 2015).
- Inclusion of all non-government institutions in the Education Portal is still being resolved and to what degree non-government institutions are required to conform to the requirements of the Education Portal. It will be necessary to have detailed information on non-government education institutions to complete the picture of the education system.
- The relationship between data in the Education Portal and U-DISE is still being resolved. Ideally most data from U-DISE should be imported from the Education Portal and the annual census used to verify data in the system.
- Inclusion of all Education Sub-Sectors including Vocational and Non Formal education is necessary.
- Not all schools have good internet connectivity and thus the student tracking system is challenging to manage at the administrative level.
- The student tracking system needs to be made more school focussed and provide functionality useful to institutions to help engage actors at the institutional level. There is enormous scope to engage...
teachers, students and communities in the Student system. Teachers could post homework using the system and track pupil’s results. Parents could view the progress of their child and communicate via the Portal with teachers.

- There is scope to expand the use of handheld and portable devices to access information on the Education Portal.
- The MP Education Portal was established in 2007 and had been in extensive use for quite a few years subsequent to its inception; however in the later period after 2012 the application has not been in use with the same vigour as earlier. A significant challenge is encouraging its use through enforcement of good legislation and policy.
- Thus the Samagra Shiksha Portal is gradually being integrated with the Education Portal to create a single and effective Child Tracking System. This process should be completed so that data is rationalised and education staffs respond all needs through one source of data on children.

10.18 Reference

The Education Portal can be accessed through the Madhya Pradesh Education Portal Website at the following links:

- [http://www.educationportal.mp.gov.in/](http://www.educationportal.mp.gov.in/)
- [https://www.facebook.com/MPEducationPortal](https://www.facebook.com/MPEducationPortal)
11. Guiding Principles and Lessons Learned from State Implementation of EMIS

**Goal:** To synthesise and easily understand some of the key lessons learned through study of the implementation of EMIS.

Implementing EMIS is a large undertaking that can be broken down into smaller parts, to tackle one step at a time. Many of the success factors identified below are focused on establishing preparedness and developing an implementation plan that includes certain aspects. This will go a long way to ensuring the success of the implementation. The following lessons were synthesised from the present report and learned both from the workshop and from RMSA TCA studies on U-DISE and Karnataka and Madhya Pradesh Education systems and derived from an extensive literature search and implementation experience in over 20 countries.

11.1 Senior Management Support

Senior management’s interest and enthusiasm about the EMIS shows that they value the benefits that will be reaped from the EMIS. Since senior management are responsible for management of the education system, allocation of resources and monitoring of policies, and an EMIS can assist in aligning with those objectives, their support for the implementation will likely be related to this alignment in some way. Adoption of EMIS requires high level mandates and support from both political and administrative leaders both within and outside of the Department of Education. Strong leadership can be a vehicle for advocacy for a change in organisational attitudes and culture across the system. This change depends on the consistent and coherent commitment of education sector personnel to technology assisted management of Education. Advocacy, adequate equipment and basic training to ensure ease in the use of technology especially at decentralized levels is critical to the introduction and sustainability of a working EMIS. Equipment and training to change culture involves significant financial resources.

Senior management support is also essential for the redistribution of day-to-day EMIS responsibilities during the implementation timeframe. A fully-implemented EMIS will likely eliminate some of those time-consuming day-to-day manual activities, and so it is a matter of getting over that “hump”. Rather than allowing individuals competition time preventing them from devoting effort to the EMIS implementation. Senior management commitment will be essential to help reduce or eliminate this risk.

11.2 Involvement of Key Education Stakeholders and a Dedicated Team

Involves all main education stakeholders early in the implementation process to assist in defining the requirements and desired outputs, such as reporting and interfaces. Depending on the nature of the EMIS being implemented, Other Departments such as the Department of Finance, IT bodies, Training, Recruiting, and even the teachers unions may be potential stakeholders. It is best to identify who the key stakeholders are early in the process and encourage their participation. Implementation of an EMIS implies change to existing processes, and early involvement of stakeholders serves to heighten their buy-in to the EMIS, cooperation and acceptance of that change.

Setting up a committee or entrusting an individual with the task of leading the initial conceptualization of a comprehensive system is essential. For widespread support, the communication of this initial design to the broader department of education leadership as well as practitioners across the system.
is essential. It is important to ensure the involvement of as many stakeholders as possible during the different stages of development of a state EMIS. Overall, the committee or individual should be responsible for progress toward the final design according to the set of rules and suggestions provided by the different stakeholders.

11.3 Legislative and policy support

The introduction of effective EMIS depends on strong support from legislation and policy relating to teacher management. Equally, the systems themselves have the potential to inform policy directions that can improve teacher quality.

11.4 Time Budgeted for the Implementation

A significant amount of effort is involved in migrating from an existing solution or system, such as a paper based system, to a new EMIS. Staffs will be involved in designing the EMIS, learning the new software and testing. Budget support for all phases of implementation is essential and having excess funds available in case of exceeding cost is required. Typically software implementations will reserve 15% of budget for anticipated cost increase due to unforeseen issue such as further changes required to the system or delays in rollout. In addition the availability of funds when required is essential. It is important to carefully plan implementation to coincide with releases of available funds.

11.5 Contracting and Outsourcing Development

Developing EMIS requires professional expertise. Outsourcing the work gives access to the relevant specialist skills and ensures quality. The outsourcing could be to a single source or several different entities. The single source would depend on whether the system is a unified comprehensive system and using multiple sources divides the task into several discreet sub-tasks such as recruitment and transfer. The National Informatics Centre (NIC) can provide a viable option for outsourcing to a single source option. Outsourcing sub-tasks to different entities avoids the situation where any team become custodians or authorities of the system and promotes ownership of the system by the concerned department. However, developing the EMIS according to different sub-tasks also needs to ensure compatibility between how data is coded in different systems. This would prevent fragmentation and allow the integration and consolidated of relevant and critical information for management purposes. It is important throughout the process of establishing an EMIS, for the technology experts to work with the sector leaders that have content experience and expertise.

11.6 Limitations in U-DISE

U-DISE presents some constraints for states. There are challenges to accessing historic data because it stores each year’s data in a separate database. The coding of schools and teachers is not consistent year to year as it is linked to the geographic location and not permanent as it should be. U-DISE should be seen as a national data standard for state annual reporting to national level rather than a separate census system. Many states are now operating indigenously created systems exporting data to U-DISE for annual reporting from their state operational systems such as is planned through the education portal in MP.

11.7 Ongoing development

EMIS need ongoing development once established to accommodate the needs of different departments and changes in policies and processes. This ongoing development must be factored in and an annual budget allocated to cover the development work. It is especially important for ongoing
development to be informed by consistent evaluation of how practitioners down to the school level are using the system for managing resources and ensuring delivery of quality education. Addressing consistent culture change in the use of technology for management across the system will usher in an effective EMIS.

11.8 Maintenance and using the system for management

An effective EMIS is also dependent on the one hand, on regular maintenance and updating, which again requires budgeting adequate resources for these tasks. The use of the EMIS for resource allocation and budgeting will also be defined by the analysis and reporting of data to the political and administrative leadership at regular intervals. Only then will the cycle be complete where the analysis of consolidated information using technology enables new pathways and policies to management of the education sector.

11.9 Horizontal sharing

An annual opportunity to share experiences and knowledge of EMIS development with other states is very beneficial. There is likely to be some benefit to states petitioning the national MHRD/RMSA to facilitate horizontal sharing of systems, processes and experiences.

11.10 Ongoing Training, Support and Advocacy

There are significant challenges remain in gradually changing organisational attitudes and culture to the new systems. To this end constant advocacy and training is required, which takes significant resources. Some states have been able to utilise both online training and support and video conferencing to significantly improve the successful deployment of the systems and to reduce the costs of deployment and support.

11.11 Integrated Systems Approach

All systems should ultimately be feeding from and into a single data store. A single database and database technology should ideally be employed and a single software development environment. There should be robust data standards to enable the integration of all data and to enable all actors to understand all data.

11.12 Openness to change

Embracing the change involved in an implementation in part relies on confidence in the solution to meet the needs of the Department of Education and associated stakeholders, which can be addressed through the definition of requirements and the BPO. Preparedness for change opens the doors of thinking to creative solutions and reporting possibilities, which can actually increase the success of an implementation beyond original expectations. Promote openness to change throughout the steps identified above.

11.13 Need to revise validation processes in general

The 5% verification utilised in the data capture of U-DISE to verify school census data achieved little, either to correct poor data or to deter misreporting of data. Data verification processes should be built into ministry processes. Supervisors and inspectors should be utilized throughout the year to verify data present in systems. In cases where Student Information Systems are implemented,

---

11 As in the case of Madhya Pradesh.
verification of data can be undertaken using other more robust mechanisms such as verification of birth certificates for students and teachers. This is made possible by storing data on individual persons as opposed to aggregate data evident in systems based on the conduct of school census.

11.14 Student Information Systems and HRIS are better
Collecting and managing education data on individual pupils and teachers is vastly superior to systems which obtain aggregate data through tools such as census forms. The capacity to track students and teachers throughout their academic or teaching career is invaluable. Not only do these systems enable teachers and students to have full academic records accessible by the state but they also enable far greater analysis of the data to assist in sector planning and other activities. In addition such systems enable superior management of staff and students.

11.15 Progression towards Web Based Systems
As demonstrated in Madhya Pradesh, deployment of EMIS via the internet offers substantial cost and support benefits. Changes to the systems can be made centrally and can benefit all users instantly without the need for costly version upgrades. Training and support can be undertaken via the internet which helps reduce support costs and increase ongoing viability. Significant increases to 3G coverage throughout Asia, even to rural and remote areas, and reduced costs are ensuring internet access is becoming ubiquitous. Integration of systems and thus sharing of information between systems is easier with centrally operated web enabled systems. Data security and integrity is greatly improved.

11.16 Planning and cost analysis for new systems is crucial
Projects and Programmes have proven valid resources to assist the Development of Education Information Systems however a clear strategy should be developed prior to implementation of new systems. The strategy should state the costs of development and any anticipated increments or reductions to ongoing operational costs. Needs and requirements will change over time as policies and processes change, for example enacting a sophisticated Teacher Transfer Policy. Therefore ongoing development needs to be factored in. A budget for changing the system annually should be allocated. This will help avoid “white elephants” which are systems that failed to live up to expectations and exceeded projected development and operational costs.

11.17 Need to ensure compatibility between system data
The use of robust, unique and permanent coding standards for all entities such as schools, teachers and students has helped ensure data integrity within the systems.

11.18 Need to regularly triangulate data from systems to ensure validity
Participation rates derived from census data are inherently subject to error owing to mechanisms such as per capita finding, errors in aggregation of data on census forms and outdated or flawed population data. Household surveys will generally result in more accurate participation rates however owing to limitations on the number of households surveyed the results are usually only valid to the first sub-national administrative level (province or state). Where possible mechanisms of triangulation should be developed to help validate and verify data.
12. Evaluating Your EMIS

12.1 The Importance of Evaluating EMIS

In recent years there have been efforts to improve the evaluation of Education Management Information Systems and through the generation and use of global standards in the evaluation of EMIS. There is a critical need for a tool that can either assess a State Department of Education’s existing education information system or determine whether the country needs to establish a new system to generate value-added components to the policy monitoring, evaluating and planning process. Such a tool should be based on areas of best practice and lessons learned, as identified by the international community, especially as they relate to the four policy areas. These being:

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

A benchmarking system would allow state level policy makers to gauge the quality of their EMIS as well as how its education system compares to other systems internationally. The intended effects of EMIS benchmarking would be policy changes that improve the quality of education and, ultimately, stimulate a state’s economic growth. Benchmarking EMIS can reveal important lessons about the kind of changes needed in educational policies and institutions, such as:

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

Through Benchmarking EMIS, development needs will become apparent.

12.2 Global Standard in Evaluating EMIS

In 2011, the World Bank Group commenced a multi-year program designed to support countries in systematically examining and strengthening the performance of their education systems. Part of the World Bank’s new Education Sector Strategy, this evidence based initiative, called SABER (Systems Approach for Better Education Results), is building a toolkit of diagnostics for examining education systems and their component policy domains against global standards, best practices, and in comparison with the policies and practices of countries around the world (World Bank 2014). By leveraging this global knowledge, the SABER tools fill a gap in the availability of data and evidence on what matters most to improve the quality of education and achievement of better results.

SABER-Education Management Information Systems (EMIS) aims to help State Departments of Education and even entire countries improve data collection, data and system management, and data use in decision making. SABER-EMIS assesses the effectiveness of a states EMIS, with the aim of
informing policy dialogue and helping states better manage education inputs and processes to achieve overall efficiency and strong learning outcomes.

12.3 About SABER (Systems Approach for Better Education Results)

SABER evaluates the extent to which the EMIS is credible and operational in planning and policy dialogue as well as 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 (Abdul-Hamid 2014). It is crucial for tracking changes, ensuring data quality and timely reporting of information, and for facilitating the utilization of information in decision making.

The SABER-EMIS assessment methodology is built on the four key policy areas noted above that are essential to EMIS and must be assessed in order to understand and ultimately strengthen the system. Each policy goal is defined by a set of policy levers (actions that help governments reach the policy goal) and indicators (measuring the extent to which the policy levers are achieved) as indicated in the diagram below.

Figure 8. Key Policy Areas for EMIS

- **Enabling Environment**
  - **Policy Levers**: legal framework, organizational structure & institutionalized processes, human resources, infrastructural capacity, budget, data-driven culture

- **System Soundness**
  - **Policy Levers**: data architecture, data coverage, data analytics, dynamic system, serviceability

- **Quality Data**
  - **Policy Levers**: methodological soundness, accuracy and reliability, integrity, periodicity and timeliness

- **Utilization for Decision Making**
  - **Policy Levers**: openness to EMIS users, operational use, accessibility, effectiveness in disseminating findings

A strong enabling environment lays the foundation for an effective EMIS. Enabling environment refers to the laws, policies, structure, resources, and culture surrounding an EMIS that make data collection, management and access possible. In essence, this policy area is the context in which an EMIS exists. This defined scope of an enabling environment builds on lessons learned from studies of education management systems.

System soundness ensures key processes, structures and integration capabilities in an effective EMIS. Education data are sourced from different institutions, but all data feed into and comprise the EMIS. Databases within an EMIS are not viewed as separate databases, but as part of the whole EMIS. Key aspects of system soundness include what data is covered in the EMIS and how it comes together in the overarching system.

Quality data establishes the mechanisms required to collect, save, produce, and utilize information in an accurate, secure and timely manner. Data quality is a multidimensional concept that encompasses more than just the underlying accuracy of the statistics produced. It means that not only is the data
accurate, but that the data addresses specific needs in a timely fashion. Quality data lays the groundwork for utilization.

An effective EMIS is utilized in decision making by all users (parents, students, teachers, principals and policymakers) across the education system. An EMIS needs to be used so that measures can be taken to improve educational quality. Accurate information on education sector performance enables the design of more informed policies and programs. It is imperative to understand where decision making occurs, if the capacity to analyse and interpret education data exists, and if specific data is available to inform decisions.

Using the EMIS data collection instrument, policy levers are scored on a four-level scale (latent, emerging, established and advanced) in order to assess the extent to which both policy intent and implementation are achieved (see diagram below).

Figure 9. Measuring EMIS key policy areas

12.4 Detailed Framework for Evaluation

The main framework for evaluation is presented below and the methodology for evaluation is available online from the SABER website:


The framework presented below is best evaluated by an expert with international experience. This can help identify gaps in your own EMIS and policy and legislative framework and identify changes that can be applied to help improve the State Department of Education EMIS.
<table>
<thead>
<tr>
<th>Policy Levers</th>
<th>Indicators</th>
<th>Description of Best Practices</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Latent</td>
</tr>
<tr>
<td>POLICY AREA 1: ENABLING ENVIRONMENT</td>
<td></td>
<td>The system contains crucial components of a comprehensive enabling environment, which addresses related policy elements and enables the functioning of an effective and dynamic system</td>
<td>Emerging</td>
</tr>
<tr>
<td>POLICY AREA 1: ENABLING ENVIRONMENT</td>
<td></td>
<td>The system lacks major components of a comprehensive enabling environment</td>
<td>Established</td>
</tr>
<tr>
<td>POLICY AREA 1: ENABLING ENVIRONMENT</td>
<td></td>
<td>The system contains basic components of a comprehensive enabling environment</td>
<td>Advanced</td>
</tr>
</tbody>
</table>

**1.1 Legal Framework**

- Institutionalization of system: EMIS is institutionalized as an integral part of the education system and the government
- There is an existing legal framework to support a fully-functioning EMIS
- There is not a legal framework in place
- Basic components of a legal framework or informal mechanisms are in place
- Data supply: the legal framework mandates that schools participate in the EMIS by providing education data
- There is an existing legal framework to support a fully-functioning EMIS
- Most elements of a legal framework are in place
- There is an existing legal framework to support a fully-functioning EMIS
<table>
<thead>
<tr>
<th>Policy Levers</th>
<th>Indicators</th>
<th>Description of Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comprehensive, quality data: the requirement for comprehensive, quality data is clearly specified in the EMIS legal framework</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data sharing and coordination: the legal framework allows for adequate data sharing and coordination between the Ministry of Education and agencies and/or institutions that require education data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utilization: the legal framework emphasizes data-driven education policy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Budget: the education system budget includes a line item for the EMIS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confidentiality: the legal framework guarantees that respondents' data are confidential and used for the sole purpose of statistics</td>
<td></td>
</tr>
<tr>
<td>Policy Levers</td>
<td>Indicators</td>
<td>Description of Best Practices</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Latent</strong></td>
</tr>
<tr>
<td>1.2</td>
<td>Organizational structure and institutionalized processes</td>
<td>The system is institutionalized within the government, has well-defined organizational processes, and has several functionalities beyond statistical reporting</td>
</tr>
<tr>
<td>1.3</td>
<td>Human resources</td>
<td>Personnel: the core tasks of the EMIS are identified and the EMIS is staffed with qualified people</td>
</tr>
<tr>
<td>1.4</td>
<td>Infrastructural capacity</td>
<td>Data collection: tools for data collection are available</td>
</tr>
<tr>
<td>Policy Levers</td>
<td>Indicators</td>
<td>Description of Best Practices</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>functions in an integral manner</td>
</tr>
<tr>
<td></td>
<td>Data management system: there is a system in place that manages data collection, processing, and reporting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data dissemination: data dissemination tools are available and maintained by the agency producing education statistics</td>
<td></td>
</tr>
<tr>
<td>1.5 Budget</td>
<td>Personnel and professional development: the EMIS budget contains a specific budget for EMIS personnel and their professional development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance: the EMIS budget contains a specific budget for system maintenance and recurrent costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reporting: the EMIS budget contains a specific budget for reporting costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical infrastructure: the EMIS budget contains a specific budget for physical infrastructure costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficient use of resources: processes and procedures are in place to ensure that resources are used efficiently</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system budget is comprehensive, ensuring that the system is sustainable and efficient</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system suffers from serious budgetary issues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system has a basic or incomplete budget</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system budget contains the majority of required categories to ensure that most parts of the system are sustainable and efficient</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system budget is comprehensive, ensuring that the system is sustainable and efficient</td>
<td></td>
</tr>
<tr>
<td>POLICY AREA 2: SYSTEM SOUNDNESS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data-driven Culture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data-driven Culture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Description of Best Practices</strong></th>
<th><strong>Scoring</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A data-driven culture prioritizes data as a fundamental element of operations and decision making, both inside and outside of the education system.</td>
<td>Latent</td>
</tr>
<tr>
<td>The system suffers because there is not a data-driven culture that prioritizes data management and data utilization in decision making.</td>
<td>Emerging</td>
</tr>
<tr>
<td>The system has a data-driven culture that demonstrates a basic appreciation of data and interest in developing better data utilization practices.</td>
<td>Established</td>
</tr>
<tr>
<td>A data-driven culture exists that prioritizes data management and utilization within and beyond the education system and evidence of that culture is present in daily interaction and decision-making at all levels.</td>
<td>Advanced</td>
</tr>
</tbody>
</table>

The processes and structure of the EMIS are sound and support the components of an integrated system

**2.1 Data architecture**

<table>
<thead>
<tr>
<th>Data architecture</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Scoring</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The data architecture is well-defined to ensure full system functionality</td>
</tr>
<tr>
<td>The system's data structure does not have a well-defined data architecture</td>
</tr>
<tr>
<td>The system's data architecture includes some components, however, it is incomplete</td>
</tr>
<tr>
<td>The system's data structure has most elements of the data architecture, however, it has some deficiencies that affect the system’s functionality</td>
</tr>
</tbody>
</table>

The data architecture is well-defined to ensure full system functionality

**2.2 Data coverage**

<table>
<thead>
<tr>
<th>Administrative data: the EMIS contains administrative data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial data: the EMIS contains financial data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Scoring</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The data in the system is comprehensive and covers administrative,</td>
</tr>
<tr>
<td>The data in the system is far from being comprehensive</td>
</tr>
<tr>
<td>The data in the system includes some of the data areas</td>
</tr>
<tr>
<td>The data in the system includes most but not all of the data areas</td>
</tr>
</tbody>
</table>

The data in the system is comprehensive and covers all data areas
<table>
<thead>
<tr>
<th>Policy Levers</th>
<th>Indicators</th>
<th>Description of Best Practices</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Human resources data: the EMIS contains human resources data</td>
<td>financial, human resources, and learning outcomes data and coverage is limited</td>
<td>Latent</td>
</tr>
<tr>
<td></td>
<td>Learning outcomes data: the EMIS contains learning outcomes data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Data analytics</td>
<td>Data analytics</td>
<td>Tools and processes are available to perform data analytics at different levels on a regular basis</td>
</tr>
<tr>
<td>2.4</td>
<td>Dynamic system</td>
<td>Quality assurance measures: the system is dynamic and maintains quality assurance measures</td>
<td>The system in place is not easily adaptable to changes/advancements in data needs</td>
</tr>
<tr>
<td></td>
<td>Data requirements and considerations: there are mechanisms for addressing new and emerging data requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>System adaptability: the EMIS is elastic and easily adaptable to allow for changes and/or advancements in data needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy Levers</td>
<td>Indicators</td>
<td>Description of Best Practices</td>
<td>Scoring</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2.5</td>
<td>Serviceability</td>
<td>Validity across data sources: information brought together from different data and/or statistical frameworks in the EMIS is placed within the data warehouse using structural and consistency measures</td>
<td>Latent</td>
</tr>
<tr>
<td></td>
<td>Integration of non-education databases into EMIS: data from sources collected by agencies outside of the EMIS are integrated into the EMIS data warehouse</td>
<td>Services provided by the system are valid across data sources, integrate non-education databases into the EMIS, and archive data at the service of EMIS clients by ensuring the relevance, consistency, usefulness, and timeliness of its statistics</td>
<td>Emerging</td>
</tr>
<tr>
<td></td>
<td>Archiving data: multiple years of data are archived, including source data, metadata, and statistical results</td>
<td>There are serious issues related to data validity and consistency</td>
<td>Established</td>
</tr>
<tr>
<td></td>
<td>Services to EMIS clients: Services provided by the system to EMIS clients include ensuring the relevance, consistency, usefulness, and timeliness of its statistics</td>
<td>The data is consistent and valid; however, some concerns still exist</td>
<td>Advanced</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Services provided by the system are valid across data sources, integrate non-education databases into the EMIS, and archive data at the service of EMIS clients by ensuring the relevance, consistency, usefulness, and timeliness of its statistics</td>
<td></td>
</tr>
</tbody>
</table>
### POLICY AREA 3: QUALITY DATA

<table>
<thead>
<tr>
<th>3.1 Methodological soundness</th>
<th>Description of Best Practices</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The system has the mechanisms required to collect, save, produce, and utilize information, which ensures accuracy, security, and timely, high-quality information for use in decision making</td>
<td>Latent</td>
</tr>
<tr>
<td></td>
<td>The system lacks mechanisms to collect, save, or produce timely, high-quality information for decision making</td>
<td>Emerging</td>
</tr>
<tr>
<td></td>
<td>The system has basic mechanisms to collect, save, and produce timely, quality information; however, its accuracy might be questionable</td>
<td>Established</td>
</tr>
<tr>
<td></td>
<td>The system has most mechanisms in place needed to collect, save and produce timely, high-quality information for use in decision making; however, some additional measures are needed to ensure accuracy, security, and/or timely information that can be used for decision making</td>
<td>Advanced</td>
</tr>
</tbody>
</table>

**Concepts and definitions:** data fields, records, concepts, indicators and metadata are defined and documented in official operations manuals along with other national datasets, and endorsed by the government.

**Classification:** there are defined education system classifications based on technical guidelines and manuals.

**Scope:** the scope of education statistics is broader than and not limited to a small number of indicators (e.g., measurements of enrolment, class size, and completion).
<table>
<thead>
<tr>
<th>Policy Levers</th>
<th>Indicators</th>
<th>Description of Best Practices</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Latent</td>
</tr>
<tr>
<td>Basis for recording: data recording systems follow internationally accepted standards, guidelines, and good practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source data: available source data provide an adequate basis for compiling statistics</td>
<td></td>
<td>Source data and statistical techniques are sound and reliable, and statistical outputs sufficiently portray reality</td>
<td></td>
</tr>
<tr>
<td>Validation of source data: source data are consistent with the definition, scope, classification, as well as time of recording, reference periods, and valuation of education statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical techniques: statistical techniques are used to calculate accurate rates and derived indicators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professionalism: EMIS staff exercise their profession with technical independence and without outside interference that could result in the violation of the public trust in EMIS statistics and the EMIS itself</td>
<td>Education statistics contained within the system are guided by principles of integrity</td>
<td></td>
<td>Education statistics contained within the system are guided by principles of integrity (1 of the 3 principles of professionalism, transparency, and ethical standards)</td>
</tr>
<tr>
<td>Transparency: statistical policies and practices are transparent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethical standards: policies and practices in education statistics are guided by ethical standards</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

December 2015 Draft
<table>
<thead>
<tr>
<th>Policy Levers</th>
<th>Indicators</th>
<th>Description of Best Practices</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.4</strong> Periodicity and timeliness</td>
<td>Periodicity: the production of reports and other outputs from the data warehouse occur in accordance with cycles in the education system</td>
<td>The system produces data and statistics periodically in a timely manner</td>
<td><strong>Latent</strong></td>
</tr>
<tr>
<td></td>
<td>Timeliness: final statistics and financial statistics are both disseminated in a timely manner</td>
<td>The system produces data and statistics neither periodically nor in a timely manner</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system produces some data and statistics periodically and in a timely manner</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system produces most data and statistics periodically and in a timely manner</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system produces all data and statistics periodically and in a timely manner</td>
<td></td>
</tr>
<tr>
<td><strong>POLICY AREA 4: UTILIZATION FOR DECISION MAKING</strong></td>
<td>The system is wholly utilized by different users for decision making at different levels of the education system</td>
<td>There are no signs that the EMIS is utilized in decision making by the majority of education stakeholders</td>
<td><strong>Latent</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system is used by some education stakeholders, but not for major policy decision making</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system is used by most education stakeholders, but is not fully operational in governmental decision making</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system is wholly utilized by different users for decision making at different levels of the education system</td>
<td></td>
</tr>
<tr>
<td><strong>4.1</strong> Openness</td>
<td>EMIS stakeholders: EMIS primary stakeholders are identified and use the system in accordance with the legal framework</td>
<td>The system is open to education stakeholders in terms of their awareness and capacity to utilize the system</td>
<td><strong>Latent</strong></td>
</tr>
<tr>
<td></td>
<td>User awareness: current and potential EMIS users are aware of the EMIS and its outputs</td>
<td>The system lacks openness to education stakeholders in terms of their awareness and capacity to utilize the system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User capacity: EMIS users have the skills to interpret, manipulate, and utilize the data produced by the system in order to ultimately disseminate findings</td>
<td>The system is open to some education stakeholders in terms of their awareness and capacity to utilize the system</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system is open to the majority of education stakeholders in terms of their awareness and capacity to utilize the system</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The system is open to all education stakeholders in terms of their awareness and capacity to utilize the system</td>
<td></td>
</tr>
<tr>
<td>Policy Levers</td>
<td>Indicators</td>
<td>Description of Best Practices</td>
<td>Scoring</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Operational use</strong></td>
<td></td>
<td>Latent</td>
</tr>
<tr>
<td>4.2</td>
<td>Utilization in evaluation: Data produced by the EMIS is used to assess the education system</td>
<td>Data produced by the system is used in practice by the main education stakeholders</td>
<td>Data produced by the system is not used in practice by education stakeholders</td>
</tr>
<tr>
<td></td>
<td>Utilization in governance: Data produced by the EMIS is used for governance purposes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utilization by schools: Data produced by the EMIS is used by schools</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utilization by clients: data produced by the EMIS is used by clients (including parents, communities, and other actors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utilization by government: the system is able to produce summative indicators (derived variables) to monitor education system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Accessibility</strong></td>
<td>Education statistics are presented in an understandable manner, are widely disseminated using clear platforms for utilization, complemented by user support</td>
<td>The system suffers from serious accessibility issues</td>
</tr>
<tr>
<td>4.3</td>
<td>Understandable data: data are presented in a manner that is easily digestible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Widely disseminated data: education statistics are disseminated beyond the Ministry of Education and/or the education statistics-producing agency to other EMIS stakeholders</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Platforms for utilization: platforms are standardized across the EMIS and are customizable to user needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy Levers</td>
<td>Indicators</td>
<td>Description of Best Practices</td>
<td>Scoring</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>-------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Latent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Emerging</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Established</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Advanced</td>
</tr>
<tr>
<td>4.4</td>
<td>Effectiveness in disseminating findings</td>
<td>Dissemination strategy: national governments have an information dissemination strategy in place</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dissemination effectiveness: dissemination of EMIS statistics is effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dissemination of education statistics via an EMIS is strategic and effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dissemination is neither strategic nor effective</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dissemination is reasonably strategic, but ineffective</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A dissemination plan has been implemented; however, there is room for improvement (for full effectiveness in relation to strategic engagement)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The dissemination of education statistics via an EMIS is strategic and effective</td>
<td></td>
</tr>
</tbody>
</table>
Annexure 1: Bibliography


CIPS (2015) Madhya Pradesh Education Portal, A Case Study with Details for Replication, Centre for Innovations in Public Systems (CIPS),


RMSA TCA (2015b) *Guidelines to develop Human Resources Management Information System (HRIS) for Indian State Ministries of Education*, October 2015, RMSA TCA, DFID, Government of India

RMSA TCA, NUEPA (2014) *U-DISE Guidelines for Filling-Up Data Capture Format*, National University of Education Planning and Administration (NUEPA)


Annex 1. Madhya Pradesh Education Portal

The Education Portal: An Overview

The Education Portal an integrated and comprehensive e-Governance System for enhancing the performance of school education sector by providing proactive, transparent & accountable governance.

Links:
- [http://www.educationportal.mp.gov.in/](http://www.educationportal.mp.gov.in/)
- [https://www.facebook.com/MPEducationPortal](https://www.facebook.com/MPEducationPortal)

The portal is capable of managing most aspects of schools including pupils, teachers, assets and finances. The portal has been professionally developed by the National Informatics Centre (NIC). The portal is comprised of a suite of e-governance applications to streamline and automate process involved in core functions of the education sector. It provides a common Integrated Online Platform for all stakeholders.

Online school management information system

- Integrated database of over 1.25 lac government schools and 48,000 private schools
- Geo-locations of schools along with infrastructure, facilities and mechanism for RTE compliance
- Private schools: online recognition as per RTE norms
- Private schools: reimbursement of tuition fee of students admitted under provisions of RTE
- Quick and real-time dissemination of authentic information

Functions managed by the Education Portal are summarised below. The MP Education Portal has been widely praised and has been given the following awards and recognition.

- ‘Gold Icon’ National Award for E-Governance 2010 of Govt of India
- CSI-Nihilent e-Governance Award of Excellence 2009
- PC Quest: Best IT Implementation Project 2010 [Best e-Governance Project of India]
- Manthan Award South Asia 2009
- Best IT project for Masses Award of Madhya Pradesh Government - 2009

Portal Design and Architecture

The Education Portal has the following design and Architecture:

- Role based system
- Single – sign on for all applications
- The user is allowed to use of various modules and its functions as per the role & authorization.
- Role can be Admin, Approver, Data Entry
- Authority – DDO, DEO, DPC, BEO, BRC, Public
- Scalable architecture to accommodate more applications and users (APR,NPS,Pratibha Parva etc.)
- Flexibility of adding more Roles, authorities as per the requirement (Monitoring of Court Cases)
- Web-based, online system
- Captures transactions
• Dynamic and Database driven
  • All reports and queries are dynamically calculated and displayed on the fly.
• Can be accessed 24X7 from anywhere
  • From School, Home, Internet cafe or anywhere using internet facility
• Each and every transaction/operation is logged
• All kinds of usage reports and statistics are available on the fly

Inter-connected Database of Core Entities and Layers and their mappings
• Districts
• Blocks
• DDOs
• Office and School Types
• JSKs
• Schools and Offices
• Designations
• Teachers/Staff

Login-Passwords provided to
• 3500 DDOS/HSS Principals
• District Education Officers
• District Project Officers
• Blocks – BEO, BRC
• All KGBV Wardens
• Sections of RSK/DPI/CTD
• All Civil Engineers and officers who conduct inspections
• More than 3.50 Lakhs Teachers/Employee

Modules

The following is a summary of modules available through the Education Portal:
• Online Payroll Application
• Guest Teachers deployments
• HRMIS – E Service Book
• Portal Application for Content Management
• Quality Improvement -Pratibha Parva
• Registration for Various Awards - Teacher’s, Inspire
• Civil Works Management and Monitoring
• Schools Inspections – Monitoring, Follow-up & Management
• Right to Education Act 2009
• VER, Child Tracking, Enrolment ,Out of School Children (OOSC) management - Registration, Follow-up and childwise Tracking
• Child With Special Needs (CWSN)- Registration, Assistance and Tracking
• Free Text Books Distribution System
• Free Cycle Distribution System:- Student name wise Information
• Free Uniform & Scholarships
• KGBV Module:- Student’s name wise Information
**Education Portal, Brief Description of Each Individual Module**

**Online Services to Teachers**
- Allotment of a unique – ID to be used for all official matters.
- Timely payment of salaries.
- Online availability of pay-details, pay-slips and other details.
- Online Service Record (E- Service Book)
- Online Counseling after promotion.
- Online registration, follow-up and redressal of teacher’s grievances.
- Online availability of all orders, circulars, training announcements, Learning Resources
- Online availability of staff position in other schools for planning/requesting the transfers
- Teacher Portal

**Payroll services to DDO**
- Automation of various Processes
- Effort-less and Online preparation and generation of all pay-bills and related schedules cut down efforts on repetitive manual work.
- Elimination of existing repetitive and time-consuming manual system
- SMS Alerts on salary, new activities

**E-Service Book**
- Not a Scanning of present Service Book, information is available in a database. Scanned copy of critical documents (Appt Order etc.)
- This information is used to generate various type of HR Reports

**Civil Works**
- Online database of civil works construction under SSA being carried out in various schools under various schemes.
- All works categorized as per types and mapped with DISE Code of schools
- Administrative/Technical sanction, photographs of all the civil-works
- Mapping with Sub-engineer
- Progress of all the works are being captured.
- Engineers performance measured on the basis of portal report
- Analytical reports facilitate
  - Online monitoring and analysis of updations all works.
  - Social audit
  - Transparency

**OOS Children**
- Registration of OOS Children with their profile
- Continuous tracking of follow-up efforts made by the concerned authorities for their enrollment and mainstreaming.
- Common public can also report an out of school child for mainstreaming.
- Analysis of reasons for OOS

**Children with Special Needs**
• Registration of Children with Special Needs
• Details of their medical examination and assistant extended to the CWSN is captured to facilitate the analysis and assistance to needy.

For parents and children
• Online availability of various welfare schemes of the Government and the procedure to be followed for availing the same.
• Online mechanism for submission of Questions and problems to be answered by Subject experts.
• View the details of the teachers and other related staff available at the school
• View the details of the infrastructure and facilities available at the school
• Resources for Effective learning by students
• Enhancing achievement levels of students

RTE Services to Private Schools
• Online Registration of Private Schools Details under RTE
• Online mechanism for
  ▪ Submission of Inspection details by Block Elementary Education Officer
  ▪ Granting Recognition by DEO based on RTE norms
• Recognition Certificate generates through Portal.
• Online view of infrastructure/facilities/Seats/Fee structure and Recognition Certificate
• Online Reimbursement of Fee of Children of Disadvantage group admitted under RTE

School Inspectors
• All Inspecting officers can enter the details of the inspections carried out by them.
• The problems related to absent teachers, short attendance, textbook related problems reported by the inspector are made available to the concerned authority for necessary follow-up action.
• State-level/district-level/block level and school level analysis and monitoring of various types of issues/problems and follow up action taken by the concerned authority.

Pratibha Parv: Initiative for Quality improvement
• Pratibha Parv was launched in Madhya Pradesh in 2011-12.
• A comprehensive and holistic assessment program to assess and evaluate:
  • Achievement level of students
  • School activities
  • Existing infrastructure of schools
  • All 1.12 lac schools assessed twice in a year for the past 2 year.
  • Over 1 crore children covered in schools

Efforts and Achievements
• Trainings on usage of various application facilitated by Portal provided to all
  ▪ Division and District level Officers
  ▪ DDOs
  ▪ BRCs
• Mode of Training is Face to Face and Distance mode using VC facility of NIC and Edusat
Module wise User Manual covering the functionality of the applications
Order issued by State Government for compulsorily using the online payroll system for
the generation of Pay-bills.
Order issued by Finance department to Treasury Officers to accept the pay bills generated
using the online payroll system.

Financial Implications

The online application has been developed in house. No expenditure has been made on
software development
No expenditure has been made on the purchase of the hardware and system software
No financial burden to State Govt. exchequer for its operation
The application is a role based application and all individuals perform their respective
functions online and hence the workload is distributed amongst various functionaries.
Existing set-up of the schools/offices is being used for using the application.
The schools/users can also use the public internet kiosks /CSCs for using the
services/modules of the portal.

Impact – Online DSS

Over 2.5 crore hits since July’2008
Manpower management and financial management
On-line availability of vacancy position at various schools for timely manpower planning/
appointments/ transfer of teachers/staff e.g. providing guest teacher
Rationalization of the staff for ensuring proper Pupil-Teacher Ratio in schools.
Continuous updation of the database of schools, teachers and staff as it has been linked
with the pay.
Effective and efficient use of manpower resources.
Generation of the requirements of the teachers as per RTE.
Allocation of facilities i.e. teachers/rooms etc. based on the updated information.
Checking unauthorized transfers, attachments and fake appointments.
Effective Inspection and their follow-up
Minimization of grievances
Transparency in all operations/decisions
Facilitation of social audit

Pratibha Parv: Areas of Assessment

Academic Areas:

Status of the completion of curriculum
Status of homework and its checking
Identification of A, B, C, D and E grade Students, Subject, Class and Schools
Special coaching and strategies for them

School Activities

Organisation of assembly
Special Mid-day meals serving,
Personal hygiene of the student
General knowledge of the student
• Completion of the syllabus
• Celebration of national festivals and other events e.g. Children’s day etc.
• Attendance of students (Reported and actual)
• Maintenance of school records
• Identification of A,B,C,D & E graders at Primary & Upper-Primary Districts working on the gaps in performance levels of students by arranging special coaching and academic additional support needed by teachers.
• Emerging overall ranking of the districts, Blocks and Schools in the state and trends across the districts in order of “top to bottom Districts/Blocks/CRCs/Schools”
• Identification of the gaps in the form of learning achievements, to ensure the quality in the performance of the children.
• Assessment of the student attendance.
• Pratibha Parv results also used to Award Sampoorna Shikshit Gram Yojna (SSGY)
• Pratibha Parv results also used to Award Shikshak Prothsahan Yojna (SPY)
• Organize subject-wise training of the teachers
• Identification of good performer and low performer Teacher in specific subject and specific class.
• Identification of Good -Low performing teacher in specific subjects and specific classes
• Development of “Academic Improvement Plans”

• School Mapping
  • Creation of online GIS and web platform
  • Geo-tagged photographs of facilities and infrastructure required for compliance of RTE norms
  • GIS facilitate scientific planning and compliance of various provisions of the RTE Act, 2009
  • GIS based Decision Support System for rationalisation of schools
  • Use of GIS for planning new schools
Annexure 2: About the NIC

Link: [http://www.nic.in/](http://www.nic.in/)

National Informatics Centre (NIC) was established in 1976, and has since emerged as a "prime builder" of e-Government / e-Governance applications up to the grassroots level as well as a promoter of digital opportunities for sustainable development. NIC, through its ICT Network, "NICNET", has institutional linkages with all the Ministries /Departments of the Central Government, 35 State Governments/Union Territories, and about 625 District administrations of India. NIC has been instrumental in steering e-Government/e-Governance applications in government ministries/departments at the Centre, States, Districts and Blocks, facilitating improvement in government services, wider transparency, promoting decentralized planning and management, resulting in better efficiency and accountability to the people of India.

"Informatics-led-development" programme of the government has been spearheaded by NIC to derive competitive advantage by implementing ICT applications in social & public administration. The following major activities are being undertaken:

- Setting up of ICT Infrastructure
- Implementation of National and State Level e-Governance Projects
- Products and Services
- Consultancy to the government departments
- Research and Development
- Capacity Building

During the last three decades, NIC has implemented many "network centric" application software for Programme implementation in various ministries and departments, using state-of-the-technology software tools. During 1980s and early part of 1990s, the policy thrust was on creating "Management Information System (MIS)" and "Decision Support System (DSS)" for development, planning and responsive administration in governments which led to the genesis of present day "e-Governance" / "e-Government". "Bridging the Digital Divide", "Social and Financial Inclusion through ICT" and "Reaching- the-Unreached" concepts were tried and made operational in the late nineties. NIC has vast expertise and experience in the design, development and operationalisation of various e-Government projects in the areas of Public Administration and Governance like Agriculture & Food, Animal Husbandry, Fisheries, Forestry & Environment, Industry, Education, Education, Budget and Treasury, Fiscal Resources, Transport, Water Resources, Court Management, Rural Development, Land Records and Property registration, Culture & Tourism, Import & Exports facilitation, Social Welfare Services, Micro-level Planning, etc. With increasing awareness leading to demand and availability of ICT infrastructure with better capacities and programme framework, the governance space in the country witnessed a new round of projects and products, covering the entire spectrum of e-Governance including G2C, G2B, G2G, with emphasis on service delivery.

NIC provides Nationwide Common ICT Infrastructure to support e-Governance services to the citizen, Products and Solutions designed to address e-Governance Initiatives, Major e-Governance Projects, State/UT Informatics Support and district level services rendered.

NIC has set up state-of-the-art ICT infrastructure consisting of National and state Data Centres to manage the information systems and websites of Central Ministries/Departments, Disaster Recovery Centres, Network Operations facility to manage heterogeneous networks spread across Bhawans, States and Districts, Certifying Authority, Video-Conferencing and capacity building across the country.
National Knowledge Network (NKN) has been set up to connect institutions/organizations carrying out research and development, Higher Education and Governance with speed of the order of multi Gigabits per second. Further, State Government secretariats are connected to the Central Government by very high speed links on Optical Fibre Cable (OFC). Districts are connected to respective State capitals through leased lines.

Various initiatives like Government eProcurement System (GePNIC), Office Management Software (eOffice), Hospital Management System (eHospital), Government Financial Accounting Information System (eLekha), etc. have been taken up which are replicable in various Government organizations.

As NIC is supporting a majority of the mission mode e-Governance projects, the chapter on National e-Governance Projects lists the details of these projects namely National Land Records Modernization Programme (NLRMP), Transport and National Registry, Treasury Computerisation, VAT, MG-NREGA, India-Portal, e-Courts, Postal Life Insurance, etc. NIC also lays framework and designs systems for online monitoring of almost all central government schemes like Integrated Watershed Management (IWMP), IAY, SGSY, NSAP, BRGF, Schedule Tribes and other Traditional Forest Dwellers Act etc.

ICT support is also being provided in the States / UTs by NIC. Citizen centric services are also being rendered electronically at the district level, such as Income Certificate, Caste Certificate, and Residence Certificate etc. along with other services like Scholarship portals, permits, passes, licenses to name a few.

In executing all these activities, NIC has been given recognition in terms of awards and accolades in International as well as National levels, which are listed in the Awards Section.

Thus, NIC, a small program started by the external stimulus of an UNDP project, in the early 1970s, became fully functional in 1977 and since then has grown with tremendous momentum to become one of India's major S&T; organizations promoting informatics led development. This has helped to usher in the required transformation in government to ably meet the challenges of the new millennium.
Annexure 4: Example of an EMIS Policy (Template)

1.0 Policy Objective

1.1 The purpose of this policy is to provide a framework that will enhance and facilitate effective, efficient and timely data collection from schools and reporting to the Department of Education (herein after referred to as DoE) and all stakeholders throughout <Indian state name>. This policy is also designed to ensure that the collection and entry of data is undertaken with care and concern to continually raise the quality of data held in the Education Management Information System (herein after referred to as EMIS) database.

2.0 Policy

2.1 The collection of information from schools shall be done in an efficient and timely manner without hindering the learning and teaching process.

2.2 The dates for collection of data will be specified for each academic year and must be complied with.

2.3 Any other government or non-government organisation or individuals wishing to collect information from government schools, must obtain prior approval from the Permanent Secretary for Education (herein after referred to as PSE).

2.4 <for web enabled systems> All heads of schools with internet connectivity shall upload their relevant school data into the EMIS database in a timely manner. Schools without internet connectivity shall accurately complete the EMIS Questionnaire Forms and promptly submit the original to the Block Education Office. A copy should be retained by the school for records.

2.5 Block Education Officers by virtue of their supervisory roles shall vet and ensure accuracy of the data submitted by the schools.

2.6 All training needs related to EMIS Database shall be the responsibility of the Department of Education.

2.8 The Block Principal Education Officers and School Heads shall ensure the timely submission of current, correct and complete school data. Failure to comply shall result in disciplinary action.

3.0 Background

3.1 The DoE, through the Block Education Office is required to provide information for the regular reporting requirements of the MoE and on a needs basis. The documents that outline and require regular performance reporting include:

a) Department of Education Annual Report
b) Department of Education Strategic Development Plan
c) Department of Finance Report
d) UNESCO Statistical Data on Educational Attainment
e) UNESCO’s MDG and EFA achievements
f) <Include further here>

3.2 The DoE acquires and stores a huge amount of information. The information in the past had been collected by various sections and stored in hard-copy form or in a variety of databases within the various sections of DoE. There was significant duplication of information collected that contributed
negatively to work loads of schools, blocks, districts and Central Office staff. A single school information system was developed and then enhanced to store most required data (EMIS).

3.3 Previously the school information was collected using U-DISE Forms that were completed by the schools and entered into U-DISE by officers at the Block Education Office. The school data is now entered by the schools themselves through the EMIS database web interface. Schools without access to the internet connectivity enter the data on paper and it is uploaded by the district into EMIS database. <for EMIS storing attendance data> Schools also enter weekly attendance data into EMIS database, which provides timely reports on student attendance.

3.4 Any authorised users with an internet connection can easily access the key performance indicators required by Government by logging in to EMIS database using their log in name and password. An official can thus view the data and generate the indicators at his or her desk. All users, from schools, districts and the government, belong to a user group which determines which data they can view and which data, if any, they are allowed to change.

4.0 Definitions

4.1 Education Management Information System (EMIS)

EMIS is a database of school, student, teacher and other information that simultaneously meets a range of DoE’s needs and is accessible to all levels of the Ministry. The uses of EMIS database include:

1. The regular reporting on a needs basis, to Government on its major policy objectives and performance indicators for Education,
2. Reporting to Government, through the DoE Annual Report on a range of indicators,
3. Providing information to DoE Management to enable them to carry out their operational work effectively and efficiently,
4. Providing information to DoE Management to assist with decision making and planning and
5. Providing information to schools to assist with their decision making and planning.

4.2 Structured Query Language (SQL)

Is a computer language designed for users to formulate complex requests for specific data in a relational database management system?

4.3 School

Inclusive of all premises where learning and teaching take place, including Early Childhood Education Centres, Special schools and vocational centres / schools.

4.4 Users with Read Access, Users with Write Access

Users with *read access* to data can view it but not change it in any way.

Users with *write access* to data can view and change the data, including entering and deleting data.

5.0 Relevant Legislation and Authorities

a) The Constitution of the Republic of India
b) ICT Development Policy
c) National Informatics Centre (NIC)
d) National Strategic Development Plan
e) Education Sector Strategic Development Plan
f) Ministry of Education Annual Reports
g) Education Act
h) Public Service Act
i) Public Service Code of Conduct
j) <List others legislation and authorities and note changes to above>

5.0 Procedures

5.1 Collection of School Information from Schools

5.1.1 Any ECE centre, primary, secondary, or vocational schools whether government, non-government and registered by the DoE is required to submit data to EMIS database in a timely and efficient manner. This data includes start and end of school year data, attendance, infrastructure and the financial data.

5.1.2 The School Heads (Head Teachers and Principals) shall ensure that their school information entered into the EMIS database strictly adheres to the guidelines and the data is current, correct and complete.

5.1.3 <for student information systems> Schools shall upload or submit certain compulsory information on student registration in the respective fields provided either in EMIS database or on the paper-based EMIS form. For Indian students, the Birth Registration number shall be uploaded or submitted. For international students, the passport number shall be uploaded or submitted in place of the Birth Registration No. The citizenship classification of the student must also be provided.

5.1.4 Submission of information on school finance shall be provided by the School Management upon the request of the school head.

5.1.5. Financial information entered into the EMIS database budget acquittal system by the school to account for payments made shall be entered by the school within three (3) days of the payment being issued.

5.1.6. Schools discovered to have deliberately entered false information into the EMIS database onto EMIS related forms, or submitted such information to the DoE will be subject to disciplinary penalties.

5.1.7 Any paper based EMIS database questionnaire forms shall be submitted to the school’s Block Education Offices in a timely fashion. Data from such forms is entered in to EMIS database by the respective Education Block.

5.2 Disciplining Non Complying School Heads and Block and District Offices

5.2.1 Discipline measures for School Heads and Block and District Education Managers Officers shall include suspension of salaries or disciplinary proceedings or criminal charges.

6.3 Timelines

5.3.1 The Block Education office ensures that all schools which have access to the internet are provided with the necessary school level user accounts before the start of the school year and all staffing records are accurate in EMIS.

5.3.2 Paper forms shall be distributed by the Block Education office to schools with no access to the internet by the start of the school year, monthly during the school year for attendance data, and before the end of the school year for end of school year data.

5.3.3 All student registration and other school-based data available at the start of the school year should be entered either into the EMIS database or on the EMIS database Questionnaire Form on the
census date in the current school year. All completed EMIS database Questionnaire Forms shall be submitted to the District Education Office, DoE and the relevant Education District Office at the earliest but no later than two weeks after the census or other due date.

5.4 Approval to Collect Information from Schools

5.4.1 Other government, non-government organisation and individuals seeking school information shall formally submit a written request with justification to the State Permanent Secretary (PS) of Education.

5.4.2 Approval on the above shall be at the discretion of the PS.

5.4 EMIS Information for Personnel with no EMIS user Accounts

5.4.1 All approved requests shall be handled by the EMIS Unit, District or Block Education Office and an appropriate response be given as soon as practicably possible.

5.4 Training in using EMIS

5.4.1 Training of senior staff, ancillary staff and users at the schools on how to extract information, standards and needs basis reports from the EMIS Database will be coordinated by the EMIS Unit upon request.

5.5 Block Education Offices

5.5.1 The State Education Office will be responsible for the printing of the questionnaire forms and attendance sheets applicable to the current school year however as the system evolves, District and Block Education Authorities may be responsible for downloading forms from EMIS database and printing, to be sent to the respective schools who need them. All forms should be printed and distributed in a timely manner, and concerns beginning of school year data, monthly attendance data and other data throughout the school year. All such forms must reach the school at least one week before the relevant deadline for the forms to be submitted to the Block Education Office, and with the exception of forms that are delivered to schools by hand, must be sent to the schools using a postage method that has both proof of posting and proof of delivery (such as registered post). The Block Education office is also responsible for the entry of such data into EMIS database, no later than ten (10) days from receipt of the completed forms.

5.5.2 As pertains the Human Resources Information Sub-System (HRIS), the resolution of issues relating to the personal data of individual teachers is the responsibility of the Human Relations (HR) Unit. If the district education office receives notification of such issues from the teachers it must pass these on to the HR Unit as soon as possible, at the same time notifying the teacher concerned that this has been done. The issues should be dealt with, and the relevant teachers notified to this effect, within ten (10) days of the receipt of notification of the issues by the HR Unit.

5.5.3 The relevant District Education Officer shall be responsible for ensuring that this policy is complied with by the respective Block Education Offices, and may recommend disciplinary action for non-compliance.

5.5.3. Financial information entered into the EMIS database budget acquittal system by the Block, on behalf of a school, to account for payments made by the school shall be entered by the block within three (3) days of the receipt of valid documentary evidence that such a payment was made by the school.

5.4 Authorized Access to Information in EMIS database
5.4.1 Authorised non-school or Ministry accounts are issued with a user name and password by the EMIS Unit, only with the approval of the Head of EMIS Unit. School accounts are managed by the Block Education Offices, teacher accounts (HRIS) are managed by the schools. Different types of user have different access rights to the data, as now defined.

5.4.2 Except where otherwise required, DoE and other authorised Ministry level users have only read access. Other government officials, representatives of aid projects and other agencies who are working with the DoE and who have received a user account are regarded as DoE users. Two levels of access are provided for this level of user. One level can view all data in the system including financial reporting. The other can view most data in the system but is prevented from viewing sensitive information such as financial reports.

5.4.3 There are two types of user in the Block Education offices: those with write access (for example, the officers who enter school data for the schools without access to internet) and those with only read access. District users can view the data for all schools in their district only and can view the records of all students in their district.

5.4.4 There are three possible user types in a School. The main School user has write access and can edit and view all records, including all the student records in the school. The Teacher can see and edit the records only relevant to their classes. Such a user cannot view the records of students in other classes. A Student user type is planned; such users will have only read access to their own personal records and will have the right to access course-related materials that are stored in EMIS database and are relevant to them.

5.4.5 Any user who deliberately corrupt or remove any data from EMIS database without authorisation or enter any data knowing it to be erroneous or access any data they are not authorised to view, perhaps by logging in using an authorised person’s log in name and password, will have their user account removed from EMIS and may also be subject to disciplinary procedures and criminal charges.

5.4.6 Any user who allows another person to log in to EMIS database using that user’s log in details may have his or her user account removed from EMIS. If the unauthorised access results in any of the cases of misconduct described immediately above both users may also be subject to disciplinary action.

5.4.7 Block Education Officers are responsible to promptly deactivate EMIS database user accounts for any school head/teacher who leaves the school. The Block Head of Education is also responsible for issuing the user account and password for a newly arriving school head, as soon as he/she assumes duty.

5.4.8 The school head is responsible for issuing the user account and password for newly arriving teachers at the school, upon assumption of duties.

5.5 Ownership of FEMIS database

5.5.1 Ownership of the EMIS database software and servers solely resides with DoE.

7.0 Communication

7.1.1 The Department of Education is required to publish online school data for each school year including financial, student, teacher and facilities data. Student and teacher data is to be published as aggregate data. Student data is to be aggregated by class and gender but age distribution may be published. Teacher data is to be aggregated by qualification, gender and level of teaching.
7.2.2 Names of individual teachers and pupils is considered confidential and may not be publically released without the specific authorisation of concerned individuals.
Annexure 4: Sample Hardware and Internet Connectivity Assessment Form

School, Block or District Authority:

Location of office (urban, rural, remote):

Internet Connectivity

1) Is your school or office connected to the Internet? Yes/No

If you presently have Internet connectivity

2) What type of Internet connection do you have (a) dialup (b) ADSL (c) 3G (d) broadband (e) other - please specify:
   a. Specify the name of your internet provider

3) To what extent is your connection fast enough for the facilitation of your work (does your connection allow you to undertake the work you require via the internet)?

   1  2  3  4
   Very slow Slow Moderate Fast

4) To what extent is your connection reliable enough for the facilitation of your work? (a reliable connection is defined as a connection that is available when required and enables you to access and operate webpages as required)

   1  2  3  4
   Very unreliable Unreliable Moderate Reliable

5) What is the cost of the Internet per year?

If you do not have Internet connectivity

6) Can you access the Internet via 3G on your phone or other device anywhere near the office? Yes/No

7) Can you access the Internet via any other location near your office such as a café, hotel or home? Yes/No

8) Do you have a plan to have the Internet enabled for your office? Yes/No
    a. If so, how much will be the annual cost?
Hardware Assessment
Please list all hardware and peripherals available in your school or office. This should include:

Computers

1. Servers
2. Laptops
3. Projectors
4. Printers
5. UPS

For each please indicate the following:

1. The number of items
2. The year procured
3. For computers the hardisk size and RAM
4. The condition of each (in need of repair, fair, good)