Education Management Information Systems (EMIS)

A Guide for Young Managers

MoE = Ministry of Education
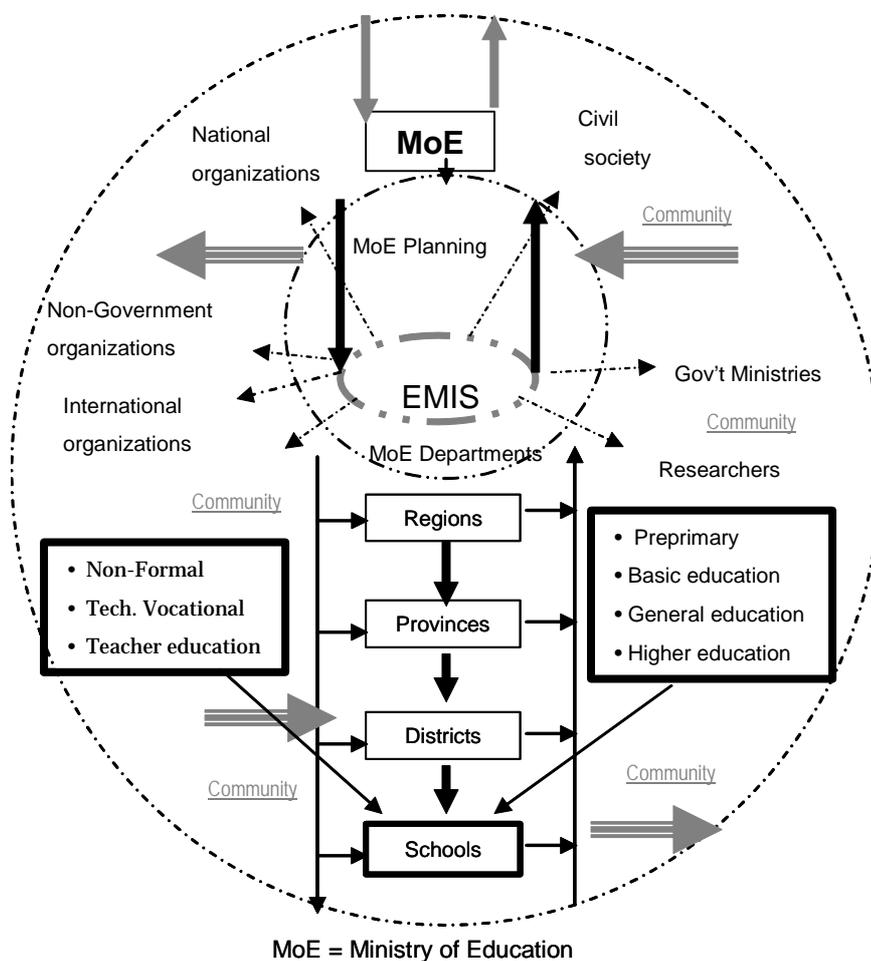
EMIS: Producer – Users Conceptual Relation

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A. Introduction

The acronym EMIS stands for "*Education Management Information System*". It is a system for organizing information base in a systemic way for the management of educational development. It is an information center in the ministry of education responsible for collection, processing, analyzing, publication, distribution, rendering information services for users of educational information.

The EMIS center of the ministry of education is responsible for the promotion and use of information within the ministry of education for policy planning, planning and implementation, decision making, monitoring and evaluation of the education system. As we are in the information age, the success lies in the use of information for development. Absence of use of information for monitoring development activities results in a retarded type of development activities.

EMIS is also responsible to give a substantial aid in the efforts made to assess the performance of education system and monitor closely the equitable distribution of resources. Take active part in providing information top management to activities such as deployment of teachers, student performance and assessment and internal efficiency of the education system, resource allocation and distribution of didactic materials to schools.

It is important to realize that statistics is part of the EMIS system. Hence, statistics of formal, non-formal, early childhood, higher education, teacher training institutions and technical and vocational institutions all are under the responsibility of EMIS. Hence, the collection, processing, analyzing and reporting of statistics in these areas remain the responsibility of EMIS center of the ministry of education. In the event that each department and sections of the ministry collects and compiles its own statistics, EMIS can obtain final products from each department or section for publication and use.

EMIS is also responsible to give a substantial support in the efforts made to assess the performance of the education system and monitor the distribution of resources, deployment of teachers, student performance assessment and review of internal efficiency of the education system etc. moreover, render technical support for research unit of the ministry of education.

Moreover, EMIS has the responsibility for a continuous capacity development of EMIS staff as well as other staff in the ministry of education through training and work towards a sustainable, self sufficient center for the provision and maintenance of educational information system.

Special assistance is expected from central EMIS for personnel at provinces and districts, and schools. The school being the major source of educational information, needs greater attention regarding training, improvement of schools records management system and awareness of the use of information for planning purposes and decision making purposes. The best approach is, from experience, is an organized program of training of trainers. In this approach, the center will train the provincial staff so that the provincial staff, in turn train their own staff at provincial level as well as the district level staff. The role of the district will be to create close contact with schools and give constant feedback and training. The other role of the district staff is to relay information, guidelines, and reports from the center to schools and back. Ensure that the schools have received the necessary instruments of data collection, filled it in correctly and sent back to districts. The data processing can be done at provincial level in a decentralized system as it is expensive to decentralize the data processing system to district level.

Finally the central EMIS plays a coordinating role, connect major stakeholders in partnership and experience sharing program while at the same time introduces Hence, the role of carrying out the work of

- Survey administration of schools – instrument design, testing, re-design, distribution and collection
- Organizing and processing, compilation and cleaning of data
- Analysis, interpretation and use of educational information
- Publication, distribution and dissemination of the outputs to users of educational information
- An overall management and planning of EMIS activities and promotion decision support systems
- Monitoring and evaluation of EMIS activities rests with this unit of the ministry of education.

- Training of personnel in EMIS at all levels rests under the responsibility of this center.

The NESIS program was engaged in capacity building in sub-Saharan Africa for over a decade under a theme country leadership, ownership and partnership. As a result awareness has increased in many countries in the region. In this noble approach, countries are to identify their problems and prioritize them. Seek solutions to their problems through partnership with professionals within own country in which professionals from departments, section, provinces, districts, school and donors participate. This proved to be successful.

Hence, the EMIS center of the ministry of education needs to take up this noble idea and lead the development of EMIS center of the ministry taking partners on board for the development of own system.

The diagram in figure 1 shows the relationship that should exist between producers and users of information on the one hand and flow of information between top decision making body and schools on the other. By This conceptual framework we intend to convey to the reader the following points:

Figure 1

MoE = Ministry of Education

EMIS: Producer – Users Conceptual Relation

a. The EMIS center is within the ministry of education (the inner circle) giving information services to all users around it.

b. directives, guidelines, demand for information and other administrative information are sent down the administrative channel to schools.

c. Reports, demand for support and other necessary information flow up from school through the same channel up to top decision making body.
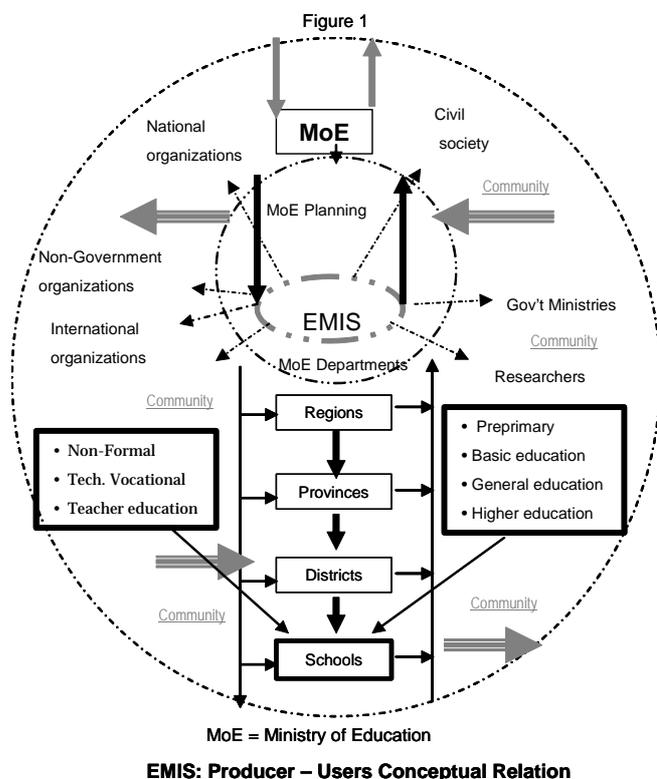
d. The top arrows show the information that comes from higher body, higher than the ministry of education (perhaps council of ministers or higher) and responses sent back to them.

e. the three bold rectangles at lower end of the figure indicate major sources of information that need greater attention.

f. At each point of the administrative channel: region, province and districts and schools, they not only receive and pass information accordingly but also process and use information at each stage. This is key to increasing awareness and appreciation for information and hence leading to quality information.

g. In all directions there are arrows pointing inwards and outwards both in inner circles and outer circles. These signify information exchange and feedback information at all levels of administrative channels and beyond. Hence, users at different stages have to get access to information and feedback information has to be collected, processed and incorporated for future enhancement.

?	Exercise 1	Traditionally the EMIS center of the ministry is structured under the planning department. Recent argument has it that the center should be structured as a department in the ministry(just like other departments) serving all the departments. Discuss the advantages and disadvantages in both cases taking into account your own country situation. Share with others and brainstorm.

B. Objectives of the manual: The objective of this training manual is to lay down the scope, structure, responsibilities of a management in an EMIS office in the ministry of education in Sub-Saharan Africa. It is intended for new managers that assume new responsibility in the area of EMIS management and new managers of different background other than information systems. We hope countries who are embarking into building an EMIS center within the ministry of education can find it useful.

C. Who can use the manual: The manual can be used as a working document by professionals in the EMIS center of the ministry of education. The manual can also be used as a reference guide for staff working in the field of

data collection, processing, analysis and dissemination work at regional and sub-regional offices of the ministry of education. Higher managers and decision makers are encouraged to read the manual to get acquainted with what the work involves and learn more on what it takes to build an EMIS center in ministry of education.

D. Goals and objectives: our goal is to promote educational development through informed decision making practices. To collect, organize and report accurate, relevant and timely data for planning and decision making purposes and to promote the use of information for educational development.

Our specific objectives are

- To create an organized unit within the ministry of education to collect, process, analyze, publish, store, disseminate and give efficient services of educational information for users.
- To promote the use of education information both internally and externally by increasing quality.
- Create a network of users and producers and increase the role of information in the development of education.
- Cultivate the ability of EMIS workers in the area of survey administration, data processing (hardware, software, networking), ability to analyze and use educational information, and the ability to manage, monitor, and evaluate the activities of EMIS and take active part in similar activities in other sectors of the ministry.

D. Management: Management is an effort made to coordinate the exertion of human and material input in order to achieve the set objectives. It is an art of coordinating knowledge and skills of people involved in EMIS activities to get the planned objectives and visions accomplished. We will introduce the concept of total quality management (TQM) in the following section.

Total quality management approach: The approach we need to adopt is that of total quality management. A philosophy that ensures the quality of data collection instruments, data processing methodology, analysis and

dissemination(including good skills to communicate to users), feedback and utilization of feedback information for future enhancement of acquiring relevant information for decision making. Quality management and leadership of the EMIS unit of the ministry including planning, monitoring and evaluation, and follow up strategy is part of the whole that need attention for total quality management. As David butler puts it

> "*Total quality management is a philosophy that integrates a focus on the user, a focus on the work process, and a focus on continuous learning*".

It refers to all the work we do in organizing and systematizing the procedure we follow, the equipment we use, the people involved in building EMIS as well as the relation between EMIS as a center of information and users. Conscious Communication between EMIS staff on the one hand and conscious communication with user on the other is vital in achieving total quality of outputs and services for the development of education.

User focused approach: The user of information is central to EMIS functions and management. There are internal and external users of educational information. Internal users are planners, decision makers, decision support systems, different departments and divisions of the ministry of education. External users are other government and non-government institutions, national and international organizations, donor agencies and civil societies. All are equally important for our work in the efforts made towards quality output.

The user is central to quality output. Hence, it is important that all we do is focused to users' needs and expectations. It is that increased use of educational information that leads to increased informed decision making. On the other hand, quality products increase the number of users. This in turn leads to increased use of information which again leads to increased level of informed decision making. This is a secret to success is not known to quite a number of EMIS workers. Such attitude and behavior of giving low profile for users should change.

Team approach: In order to effectively put to use, the knowledge one has, it is important to create a situation where all EMIS staff can work together and learn together. Create a situation where they plan, implement, and asses the impact

of their work together to meet the goals and objectives of EMIS. As common sense concept goes, *"people support what they help create"*[1]. The attitude "I am a programmer, I write my codes, the rest is less of my concern" OR "I am a statistician, I do my data analysis, the user can come and collect what is needed" OR "I am encoder, I enter data, other assignments are beyond my capacity" notion is a narrow, self breaking attitude and hence should be defeated.

Learning environment: Create a working environment that is favorable for continuous learning individually and together in harmony. EMIS by its organizational set up is a learning environment. We have the machines and manpower available. What we need to work on and achieve, is the willingness on the part of the learner and willingness on the part of the decision makers to encourage self learning as well as team learning and when necessary provide budget for such initiative. The team should learn from each other either in organized formal training programs or in an informal way by consulting each other on regular basis.

Once this is achieved, the workers feel better about them selves, and pay better attention to quality output and outcome. They put more effort to achieve the goals and objectives they started with. Moreover, this working and learning together results in an overall development of the unit and the whole of ministry as a whole. It is important to note that EMIS is both a producer and user of educational information. However, we do more of the former than the latter. This is a big opportunity which we need to take advantage of always.

The need for Assessment: Assessment to explore the need of the users is essential. EMIS management needs to focus on users. The ability to see and understand what users need is important, and once they get what they need, what the users do with that information and how that impacts on the overall development of user's organization is equally important. Planners, decision makers, decision support systems and experts in the ministry of education, among others, are core users of educational information.

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[1] Stephen G. Haines in "Reinventing strategic planning".

Assessment can be done formally by taking sample of users and interview them, and assess their feelings and interest about educational information. This can be done periodically. However, we focus on the type of assessment we obtain indirectly by reading through reports of different kinds, discussion in a meeting, discussion with friends and professionals, media reports, reading faces, reactions and gestures etc. In other words, we keep our eyes and ears open for useful comments and ideas that we can incorporate for future enhancement of our products. The better the products we come up with, the more we attract users which in turn leads to better use of information for decision making.

We are in a fast changing information era. We can't survive without mutual effort and continuous learning through team building, mutual support, and continuous learning and correct assessment and understanding of the environment we are in. More users means more appreciation for our services and more learning opportunity for us.

The challenge of EMIS management is to get dedicated professionals and workers who have vision to improve the situation and embark into a continuous learning environment and do away with 'control' and 'command' type of management. Such a management style works for the advantage of the team members within the unit, the ministry of education and contribute a lot to an overall development of country wide systems.

The central EMIS unit of the system has the responsibility of creating an objective oriented, user-focused team spirit in the provincial, district offices and schools with more emphasis to school level information systems organization and use. More awareness creation and technical assistance should be given to lower level staff of which the school is the central focus. The school being the major source of educational information, needs greater attention. In this regard the focus should be on improving

- ❖ Improving the school records management system and bring it to up to date.
- ❖ Creating awareness among school among school managers, teachers, and record officers.
- ❖ Promoting information use for planning and decision making in schools

F. Information: The nut of the acronym EMIS is the word "*information*". It is a system for the management of information for educational development. Information is an additional *knowledge* the users, desire about the functions under their responsibilities. It is this additional knowledge that users utilize to enhance planning, programming, monitoring, evaluation, review, research for the overall management and decision making of educational development.

> *Suppose that planners in country X have asked the top decision making body (perhaps policy makers) to expand construction of primary schools in rural areas in the hope of getting more girls to schools to bring about gender equity. The top decision makers have asked the planners to justify their point and come up with number of primary schools they are envisaging to construct*

The planners need information on the number of existing primary schools by urban and rural (perhaps by district as well), the distribution of enrolment in each school by sex, average distance traveled by pupils, number of children per class, number of pupils per teacher, and more. Without such basic information planners find it difficult to justify their point and win the decision makers buy their idea. Note that this is a simple scenario among the many we find in practice.

Information has value only when there is use for it. The value of information depends on the demand for it. The higher the demand for information, the more the value it has. It is this demand that we are trying to cultivate through our capacity building program.

A planner who is engaged in allocating scarce resources, say books, to school in a certain district gives more value to information on number of schools in that district. Moreover, information on number of existing books in each school in the same district give additional knowledge required which the planner can use in order to effectively carry out his assignment. Thus the later piece of information has more value than the former.
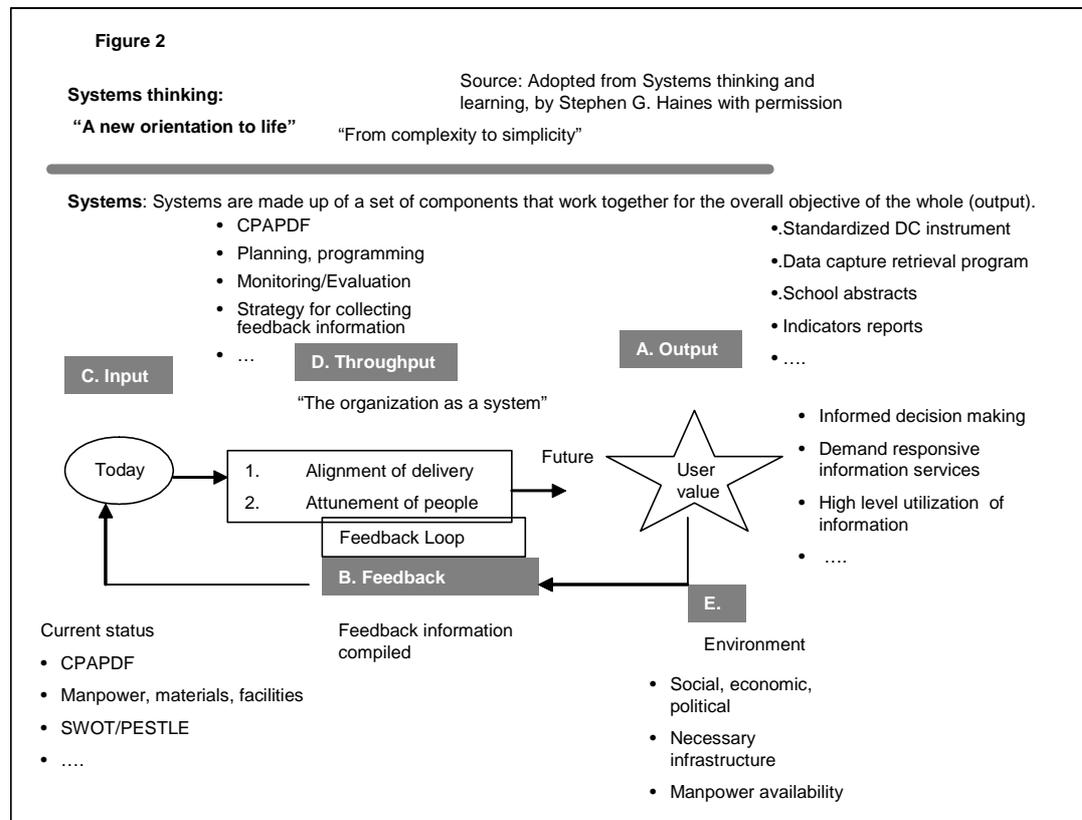
Hence, information is an increased awareness of the work we are doing or we are supposed to do which feeds back into the desire to do it better. We talk a little about the management of such knowledge in the field of education in this manual. Information is an additional knowledge users such as, policy formulators, decision makers, planners, researchers etc need not only to learn about the different functions under their responsibility but also to take rational actions and correct problems when it comes to decision making before it is too late to do so. It is a tool they use for further enhancement of the planning process.

G. The System: Stephen G. Haines, in his systems thinking approach, defines a system as follows "*a system is a set of elements or components that work together in relationship for the overall good and objective (or vision) of the whole*". He used three important phrases in his definition: working together, in relationship and vision of the whole. Working together is a collective effort on top of individual and professional effort put together to achieve desired outcome. The good relationship within EMIS staff on the one hand and the relationship of EMIS staff as a whole with all the users on the other, is also basic for the system to function properly and move in the right direction.

The system is made of components. Each component contributes to the proper functioning of the system. It is made of survey administration (which includes data collection), processing, analysis and use. We may have good survey administration in place but bad data processing or we may have a good data processing system in place but bad analysis. Even worse, we may have good survey administration, good data processing, and analysis in place but the result is never put to use and proper utilization of feedback information. None of these leads to a desired result. It is only when the whole system properly functions together that we get what we wanted, assuming that we all want a good functioning system that leads to an efficient result and an efficient accomplishment of our vision.

Figure 2 summarizes the concept of systems thinking in a short and precise way. The practice in systems thinking approach is to start by looking at the future, the

outcome or vision. The products or outputs we envisage are looked at first, unlike the usual practice in which we look at today, plans and programs, and walk through the process and look at the output at the end.

Figure 2

Systems thinking:
"A new orientation to life"

Source: Adopted from Systems thinking and learning, by Stephen G. Haines with permission

"From complexity to simplicity"

Systems: Systems are made up of a set of components that work together for the overall objective of the whole (output).

C. Input
- CPAPDF
- Planning, programming
- Monitoring/Evaluation
- Strategy for collecting feedback information
- ...

D. Throughput
"The organization as a system"

A. Output
- Standardized DC instrument
- Data capture retrieval program
- School abstracts
- Indicators reports
- ....

Today

1. Alignment of delivery
2. Attunement of people

Feedback Loop

B. Feedback

Future

User value

- Informed decision making
- Demand responsive information services
- High level utilization of information
- ....

E. Environment

Current status
- CPAPDF
- Manpower, materials, facilities
- SWOT/PESTLE
- ....

Feedback information compiled

- Social, economic, political
- Necessary infrastructure
- Manpower availability
- ...

Then today's status is assessed taking into account the environment and feedback information into greater consideration and then throughput – alignment of delivery and attunement people. This is not a one man show but it needs to be correctly understood and supported by those who take the initiative. The good vision can be taken as the good vision of EMIS as a unit within the ministry in relation to the objectives and goals of the ministry as a whole. In other words the vision of EMIS need be anchored to the policy of the ministry of education.

Then we assess the current status of the EMIS system: the strength, weaknesses, opportunities and threat in relation to political, economic and sociological, technical, legal and ecological factors into account. Each component is taken one by one and investigated. Data

Figure 3: **SWOT - PESTLE Analysis**

PESTLE	Strength	Weakness	Opportunity	Threat
Political				
Economic				
Sociological				
Technical				
Legal				
Ecological				

collection, processing, analysis, publication, distribution, dissemination, feedback information are all assessed. Moreover, the overall management, periodic evaluation, research, documentation, training are all investigated to identify problems.

Once the assessment is phase is completed and documented, we can plan for each of the component above including in-built mechanism for monitoring and evaluation and strategy for collection feedback information.

The advantages of this approach include

      a. A better communication between EMIS workers on the one hand and users on the other.

      b. The culture of working together will develop within EMIS and the capacity to mange a changing environment will develop better.

      c. A better understanding of how EMIS part work together to arrive at desired outcome and serve users better will put into practice.

In EMIS management we understand this to mean working together within our unit on the one hand and the general user on the other. In our case, this is a system of data collection, processing, analysis, publication and dissemination, and incorporation of feedback of educational information, research, monitoring and evaluation, management of educational information and other development programs. It is a coordinated system that pulls together the human and material resources to work together and achieve the desired result as stated in the goals and objectives of the system.

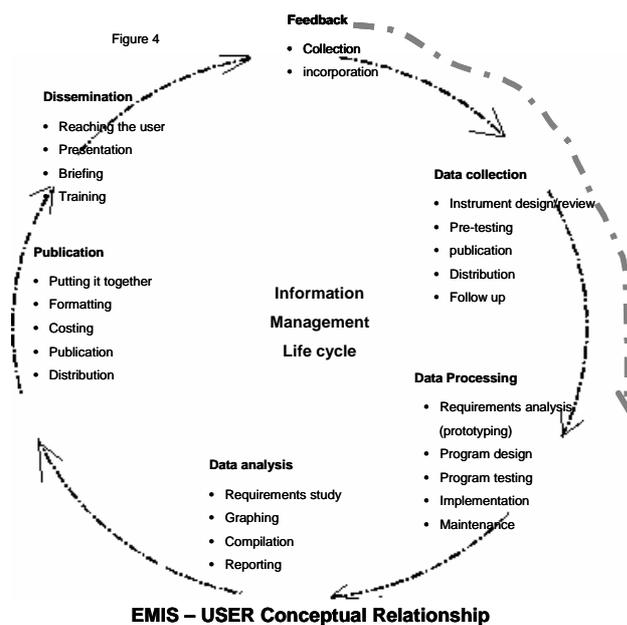## H. Components of Systems' Life Cycle

In this section we will try to go through the steps required to get the data from the field, process it, and take the result back to the users. It goes in a fashion similar to a cycle. This is a procedure chained together which we need to adhere to in order to achieve an efficient result. Any break in the middle of the procedure affects the final result. Moreover, it is an EMIS manager should see to it that every member in the cycle is performing well to achieve the desired result. If the school records are not maintained, no matter how well formulated data collection instruments are, the feasibility of data collection system is

hampered. It is no point working hard on the processing of the collected data nor spending more time calculating indicators, it won't change the result substantially.

1. **Data Collection:** if you don't have good system of records management at school level, don't expect desired result out of the data collection system. The school remains the core source of most of the required data items often not recorded in the manner desired. It is the responsibility of the EMIS manage to see to it that the records at school level be maintained properly.

   Most often data is collected through questionnaires. These are prepared at the center in a centralized system or regional offices in a decentralized system. Whichever method is followed, questionnaires are used to collect school data annually. Therefore, in practice, an assessment of what is required is needed. Knowledge of what planners, decision makers, researchers and other users need is required. What we collect should satisfy their needs, as much as possible. Therefore, we need to closely attend to their needs. Their need is our need, and our need is their need. It is a symbiotic business. The way to assess the need of the users is to take notes when attending meeting with them, causal discussions, and by having them comment on the instrument of data collection by listening to their presentations and by reading policy and plan papers etc.

   Schools: The school is the main source of data for EMIS functions. The way records are kept at school level matters a lot when it comes to data collection. School heads, teachers or record officers complete the instrument by filling in the necessary data according to the

Figure 4

EMIS – USER Conceptual Relationship

Information Management Life cycle

Feedback
- Collection
- incorporation

Data collection
- Instrument design/review
- Pre-testing
- publication
- Distribution
- Follow up

Data Processing
- Requirements analysis (prototyping)
- Program design
- Program testing
- Implementation
- Maintenance

Data analysis
- Requirements study
- Graphing
- Compilation
- Reporting

Publication
- Putting it together
- Formatting
- Costing
- Publication
- Distribution

Dissemination
- Reaching the user
- Presentation
- Briefing
- Training

questionnaire. Most often schools have data in a list form, not aggregated, to enable the school head or record officer to easily fill in the required data items. This is not a convenient way of doing it. The EMIS management has to devise ways and means of having data items ready in such a way that it is convenient to fill in the annual/regular questionnaire. This is done by encouraging assisting schools to prepare school abstract that contains required data for the questionnaire on regular basis, say yearly. It is to the advantage of both the school management and upper decision makers to have such a compiled document for reference at school level.

Instrument Design: core regular data is collected using questionnaires in most ministries education in Sub-Saharan Africa. This is perhaps because it is simpler and relatively cheaper to do so. Designing of such instrument, therefore, needs careful attention. The formulation of the questions, the layout and the syntax of the language and should be well formulated. Moreover, we need to keep in mind not only what we are expecting, but also what the receiving end understands by the questions. An experienced person should be assigned to formulate and design the questionnaire.

Pre-Testing: once the instrument is designed it should be pre-tested. This can be done by Selecting some limited number of schools and apply the instrument. This helps in many ways. 1. We get a clue as to how the receiver understands the questions after which we may adjust or modify the questions to suit both the sender and the receiver. 2. We can estimate better the time it takes to complete the instrument. 3. We can learn more on how the records are kept at school level and how easy it is to complete the questionnaire. It is important to note that, the pre-testing of the instrument should include the users – specifically the departments in the ministry with particular attention to planning department.

Instrument Redesign: once the pre-test is done, the changes need to be incorporated carefully. In practice, a thorough discussion is needed to learn from each other and 'approve' the changes to be made to the instrument. The important point here is to know why the changes were

made necessary. It helps not to repeat the mistakes made in the first place again and to look at the instrument carefully before going out for pre-testing.

Publication: once the pre-testing is done and the changes are incorporated, the instruments will have to be published. However, before the camera-ready copy of the instrument is taken to the publishers, an estimate of the number copies per region and district, leaving allowance for contingency, has to be done including the cost estimate of the publication. In practice the latter has to be approved by a higher management and usually there is an established procedure to follow.

Distribution: once the instruments are published, the distribution program will have to be made ready. The estimate of the number of copies we made earlier can be used to schedule the distribution. The estimates can easily be done by using the distribution of schools by region and district and adding some more copies in case our estimate is not accurate enough.

Follow up: the distribution of instruments is usually done in stages. The center distributes it to regions and the regions in turn distribute it to districts, and to schools. Therefore, it takes some time before the schools can receive the instruments. Moreover, the schools need some time to complete the instruments before they can be able to send it back following the same route – to district – region and may be higher administrative level. This needs a well scheduled follow up. We want to make sure all schools receive required copies on time which they can complete on time and send it back again on time. As the location of schools vary greatly, a well organized and strict follow up is necessary. How many districts have not received the completed instrument on the deadline given? How many districts have received required copies and have managed to send it back to higher administrative unit is one important information for the survey administrator at ministry level, provincial and district level.

2. Data Processing: if you haven't collected it, there is nothing to process. We plan to process data only when we have some data readily available to us. However, once we have collected data we need to plan on how to organize the many different bits and pieces of school data so that it is usable for planning purposes. When it is not well organized, it cannot rightly be utilized. Therefore data processing is one of the bigger activity in the cycle. Here we can only high light the most important ones.

Monitoring instruments: how many questionnaires have been filled and returned? Our aim is 100% return. However, in practice this is not always the case. Some come early as scheduled, some come back late, still some may not come back at all. We need to know how many have come (completed), and how many are lagging behind. The distribution of non-returned instruments by region and districts are to be identified. From this result we make a plan and schedule to contact the schools again who have not returned the completed instrument. The aim here is to find out the reasons behind failure to report back. Knowing the problem is half way into solving it. This way we can identify those schools that can be given second chance, and those that cannot be expected to report back. The latter ones are of the type that are closed, combined or merged into one. There are also other schools who fail to report, for some reason, but exist These ones become part of the category for estimation of missing data which we plan for the estimation of missing data. Some schools don't respond easily because of distance problem. Others, because of lack of reliable communication. By routinely applying such a monitoring technique we are paving the way for statisticians and analysts who are waiting for the result to estimate missing data. It is useful to have a computer program to use for such a monitoring system of school returns.

The case of missing data: no matter how hard we try, there are still some schools who do not return the completed questionnaire, or of those who returned filled questionnaire, some missing items. Some questionnaire are either fully not returned or only partially completed. The latter is often very difficult to identify and time consuming. In any case those schools, who we know exist, but only failed to report once have to

be considered for estimation. We estimate missing data for completeness and bring the information nearer to reality. We cannot ignore missing data and still hope the data will give the true picture of what actually exists. If we do, we are misleading the users of various kind. Several methods can be used to estimate mission data. Two are mentioned here

1. Browse through school database for past years and identify missing schools. Collect data for some years back (say five years). Project for current year based on the trend data

2. Often there is not enough manpower to make projections for schools (especially when they are many). Or the historical data is missing. In this case we may use past year data available to represent the current yea. However, we have to make sure the school exists. That is, the school not closed, or combined, or changed location etc.

Data entry program design: most often the data entry work is done using front end, user friendly data entry templates. These are prepared by computer programmers working in EMIS, or other private consultants or organizations who are hired for this purpose. They can also be contracted out to private firms who undertake computer programming and maintenance from time to time. However, there are big advantages to develop these programs in-house primarily because it is easier to incorporate changes whenever it occurs. Secondly it is cheaper to train and use in-house personnel to develop the program because other members can learn from each other. Thirdly, program maintenance will be easier as the programmers are within EMIS all the time. This ensures, system sustainability and prompt maintenance of the system. The EMIS management and EMIS programmers can choose the type of software, the operation program for data entry and cleaning. It is important for programmers to work closely with survey administrators in order to make the work of data entry easy and manageable. Moreover, the programmers need to produce two important manuals for reference purposes. One is the users manual used by data entry clerk. This manual tells the encoders how to enter data into the computer. What keys or key combinations they should press in order to move from one screen to the other and other operations. The second one is the programmers manual. This manual is

useful for young programmers who can learn the logic on which the program is based and learn how write similar programs and maintain it. How to modify, correct problems or adopt to specific objectives as needs may arise.

Data entry: Data entry can be done by trained encoders or data entry clerks. Secretaries who are familiar with computer keyboard can be used to do the work in the absence of trained encoders by giving short orientation training using the manual prepared for this purpose. The main job is to enter the data into the computer using the pre-prepared data entry template. The work is usually supervised by operations manager who will usually liaison with programmer who maintains[2] the program of data entry or the programmer who has developed the program.

Data cleaning: Data cleaning refers to checking for errors routinely so that what is on the questionnaire is equivalent to what is entered in the computer. This is the most laborious job, and often undermined, because of the difficulty involved in administering it. However, there are several ways of getting around the problem.

1. to include input mask, validation rules, default values etc when the data entry template is prepared. Unfortunately this technique alone cannot guarantee error free output.

2. This has to be supplemented with and organized and well scheduled proof-reading method in which two or three different groups do the proof reading. It should be borne in mind that since this checking mechanism is tiresome, it should be arranged in shifts.

3. The third way often overlooked is the method of preliminary analysis. This involves carrying out a simple analysis such as calculation of pupils per teacher, per school, percentage of girls, percentage of female teachers, teachers per class etc. When this is done at school level it gives an overview of those outliers that

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[2] Correct errors and necessary adjustments and assists the encoders as needed.

stand out and makes us suspicious. Then we can go back and check.

4. It is also useful to select a list from a flat database of schools without a teacher, schools with no classrooms, schools with no repeaters etc. moreover, maintaining a good and complete schools list by district and region is a good aid for data cleaning to identify which school has reported and which one didn't.

5. The other important point in connection with data cleaning is a look back to trend data and compare results of the current year with that of the previous year and scrutinize the outcome.

Data compilation: what we are calling data compilation is obtaining a flat table from a relational database and aggregating it by level and geographic units. You may not agree this deserves to be a step in data processing but I feel it should be included. This step makes the data set ready for the analyst who may not have a necessary knowledge of the database manipulation to the level of playing around with the database and explore all possible ways of coming up with a flat tables that can easily be aggregated to the other levels wanted.

3. Data Analysis: if you haven't processed your data, there is little you can analyze. Data analysis is looking more closely to the data and in various ways in order to get information useful for planning and decision making. We don't do data analysis just for the sake of exercises. We do the analysis to inform planners, decision makers, researchers, policy makers and other users so that they can check what they are doing is right or if they need to adjust the actions they may intend to take in the future. Therefore, we attend to the policy and plan documents, research findings to find out the concern people have in their minds about educating citizens and try to support their efforts by doing analysis and rendering information services.

Data analysis should be done with users in mind. There are several types of users: general users, decision makers, planners, researchers, information service providers, students and teachers. Some users want to

know just status. Other users base decisions on the findings of the analysis and yet others use the information for planning and research purposes. Policy makers want the information to find out if the policy they are promoting has been achieved or not. Therefore, the type of analysis we make is often geared to the needs of different categories of users. Moreover, the type of analysis we make guides us to the type of report we are obliged to compile.

It is then, imperative to make basic indicators of education systems' systems performance available for users. Viz

- Basic indicators of education systems' performance readily available
- Trend statistics and indicators are used to supplement analytical reports
- Research results used to augment other reports
- Regional, urban and rural, and gender disparity analysis analytical reports are incorporated as part of major reports
- A planning and projection simulation models be worked out to make different scenarios available for planners.

4. Reporting: The above argument suggest that the type of report we need to compile may differ depending on the type of user we are obliged to serve. Some users are satisfied with the yearly abstract or quick book references of only numbers and some indicators. Others need detailed analysis. Some services we give are as collaborative services. Others users we are accountable to report to need a detailed analysis which shows both the achievements and shortcomings. Therefore, we need to distinguish who the users are. Moreover, it is always advisable to prepare a short report of the outcome for top decision makers. Let us say, they don't have time to read a long report. Therefore, the following summary outcomes are envisaged from an EMIS unit of the ministry of education

1. *Annual statistical abstract* – This is a summary of statistical tables and some indicators for the consumption of the general public. These users are everywhere, within and outside the ministry of education who need statistics only for reference purposes. Casual researchers, monitoring and

evaluation experts, national and international organizations who use statistics to include in their background report papers are all among these type of users. Student and teachers in educational institutions, research and trust organizations are only some of the users who need the abstract for reference purposes. Hence, by producing statistical abstract we have gone some steps forward in giving information services for the general users.

2. *Quick reference:* Quick reference is a short summary of the annual statistical abstract. As the name indicates it is meant for quick reference targeted to upper decision makers and all those users who do not need detailed statistics. Some countries have already started to appreciate the use of quick reference.

3. Indicators report: This is a report of the analysis of the school systems' performance which NESIS is encouraging countries to produce on regular basis. It is prepared by the team of experts in the ministry in which planning and EMIS experts are a member. It has the objective of identifying the progress made, problems encountered and future direction of the system implementation. It is an important document in that it is a guide to planners, decision makers and policy makers to take correct actions when planning and making decisions. It is a report on indicators which can be updated on yearly basis by highlighting significant changes made over time. It is a report that should reflect the needs of planners, policy and decision makers.

5. Publication: *if you haven't published it, you haven't done anything.* The effort you have put to collecting, processing and analyzing is lost. You might have printed some reports when asked by higher decision makers, planners, researchers, and other users. You might have copied the database for a friend or an office requesting information. These are good attempts you have done to assist users. However, more techniques and methods have to be developed to reach all users. The objective is to reach all users as much as possible. One way to do this is to publish our products and distribute it to users. This way we can not only publicize our

product but also give more chance to our users to receive the products and study them when they require.

We have seen some countries still referring to individual school files, for compiling reports which can hardly be done, at least in short time. One can imagine how difficult this could be even for small business firms, let alone a huge ministry like Ministry of Education. Moreover, in a world of modern technology in which, the abstracts and reports are well arranged and are place on a web site, and made easy to use, to browse through endless data of school records is unacceptable. On the other hand, to collect, process and not publish the result is like putting a candle light in a closed can which serves no one particular purpose except the small space in which it is located.

Accountability: we are all accountable for the work we do, for the tasks under our responsibility. If we have not published it, we have not finished our work. Even if we have published it, it is still not the end of the cycle of our work. The responsibility of reaching the user, of making the outcome known to users and to use the results ourselves is remaining. This is discussed under dissemination and communication and information use of this manual.

6. Dissemination: if you haven't distributed it, you have not reached the user fully. We have limited the use of information which in turn impedes the promotion and use of information. In practice dissemination takes a number of forms

Dissemination
• Distribution
• Broadcasting
• Diffusion
• Propagation
• Spreading
• Giving out

- Distribution of school abstracts, quick references, indicators' reports, to users on regular basis
- Publication and distribution of pamphlets and posters to users
- Reports and briefing to planners and decision makers at different levels of administration.

Dissemination can be seen as both internal and external. Internally information will have to be disseminated to planners, decision makers,

decision support systems, experts and educational administrators at all levels within the ministry of education including provinces, districts and schools. This is important because

1. Progress towards creating informed decision making environment can be effected.
2. Internal users will be aware of the importance and role of information in educational development. Moreover, awareness among users is the better way that leads to better planning, policy implementation and review.

External users are those planners, researchers, students, teachers, government and non-government organizations, national and international organizations, civil societies and private individuals outside the ministry of education and the community as a whhole. This is important in that, the more they use information, the more they are aware of the role of information, the better the planning and decision making work in their respective organizations, sections and units. This also plays a feedback effect to the internal system and supports the progress made towards informed decision making and overall educational, economic and social development of a country.

Through such feedback we can realize that others know and appreciate what we are doing, suggest better ways of doing things and give more innovative ideas that could support our effort to produce timely and accurate information for an overall educational development.

7. Feedback: Through feedback we will be able to know what we have done good and where to correct problems. Others will also know what we are doing, and perhaps how easy or difficult it is about what we are doing. In the process we are learning. When we apply the feedback – knowledge and skills - for the betterment of our job, we are contributing to the development of the system we happen to be building – EMIS. At the same time we are enriching our ability and knowledge to tackle more problems.

Hence we include a mechanism for collection feedback information for all that we are doing. This can be in several ways:

1. Have a record book to monitor information from those visiting your office to keep account of what information they require and for what purpose.
2. Develop a habit of reading through policy and research papers and reports to get an idea of what these bodies are interested in.
3. Use the opportunities you have to attend meetings, individual discussion to try to read the minds of the professionals and assess the kind of information you might be able to work on in order to be able to provide them with the alternatives you can manage.

I. Scope of work and work procedures: Traditionally a statistics section existed in many counties in the ministries of education in Africa. This section was responsible for collecting and reporting statistics on schools, teachers and pupils. However, this is limited in terms of the information requirement for policy planning and implementation. Hence, the idea of EMIS was born. The idea behind moving to EMIS is to look into information requirement of the ministry from wider perspective. Hence, the idea of acquiring both quantitative and qualitative information for educational policy planning and implementation necessitated the birth of idea of EMIS. So the role of EMIS is to coordinate, in an organized and systemic way, information necessary for educational planning, policy formulation, decision making and resource allocation. This includes, information on both formal and non-formal education, higher institutions, technical and vocational education, special education and educational research institutes.

Figure 5

Collection

Processing

Analysis

Publication

Distribution

Dissemination

Feedback

EMIS: Procedure of work

The above working procedure may not be detailed enough for use. However, it lays out important steps to follow when we organize EMIS functions systematically. Activities in EMIS follow a certain established steps. The procedure begins with an appraisal of the ministry needs. Here is where you can asses what you can collect, from where and what you cannot collect. It is here that you can investigate into what the ministry needs in order to plan, make sound decisions, and conduct research work. This in turn is derived from what the
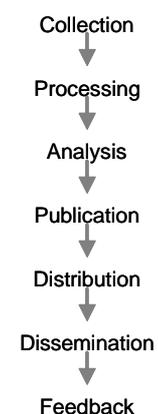
ministry is going or intends to be doing. This means a decision has to be reached as to what to collect and what not, balancing between the needs and the manpower available and the material and financial resources available or can be made available.
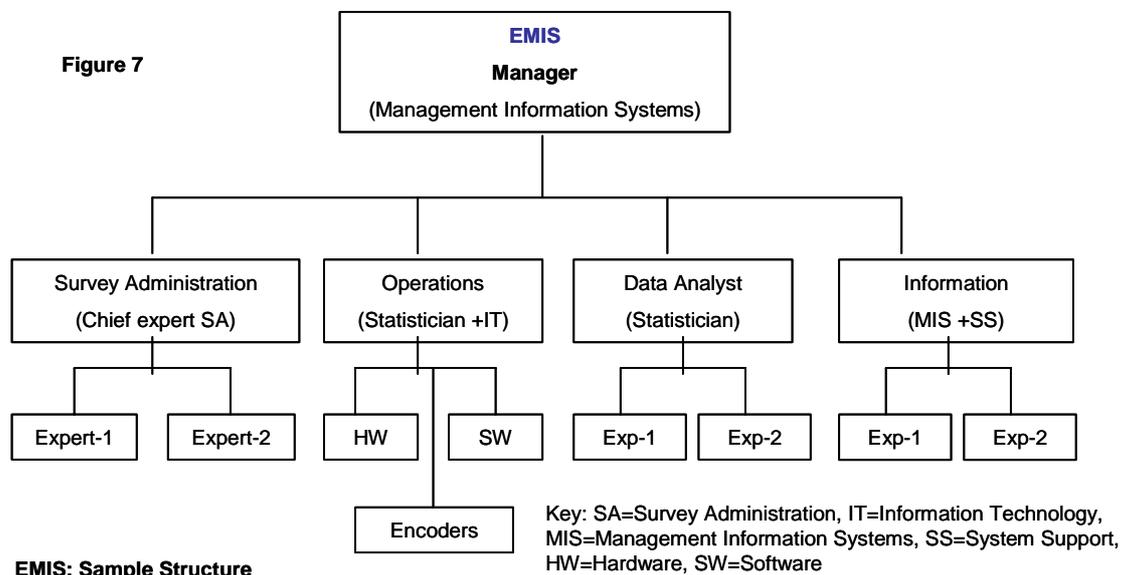

Figure 6: Scope of Work
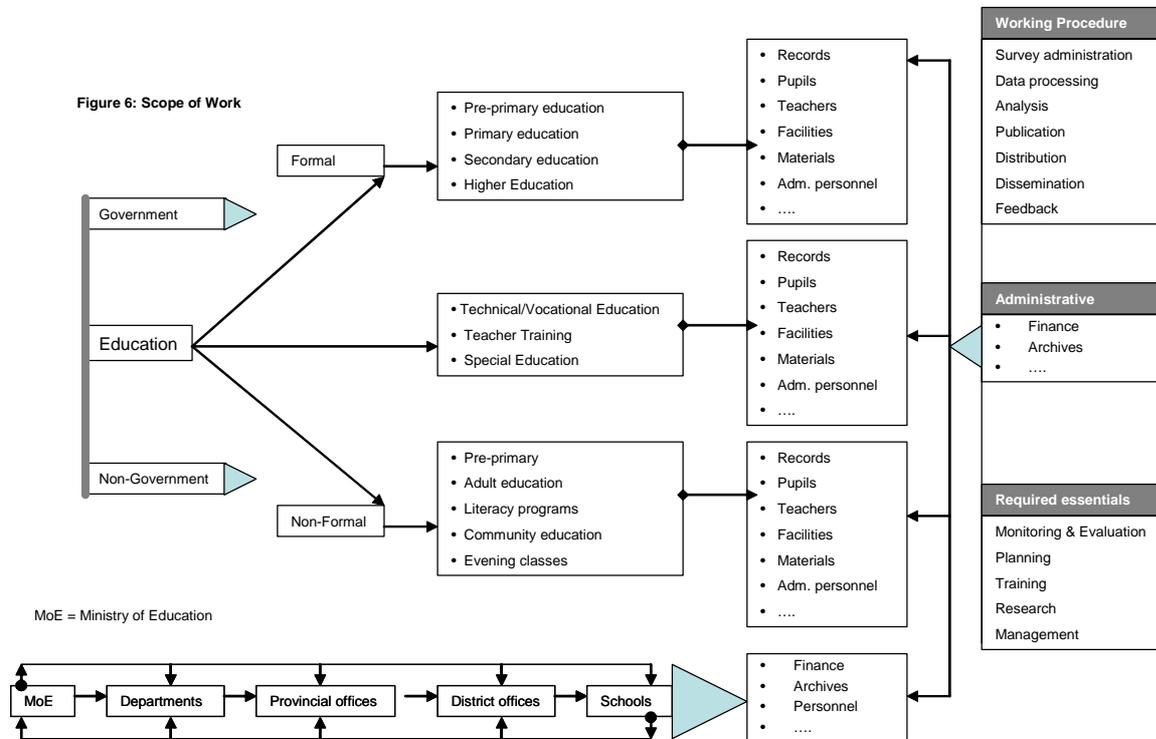
This is followed by data processing, analysis, publication, and dissemination. Dissemination includes reporting to relevant clients within or outside the ministry. This is an established working procedure with each step tied together with another so much so that the incompletion of a single step implicates the incompletion of the other and the incompletion of the whole. Hence we cannot separate them without affecting the role each one plays in order to arrive at a complete set of functions in EMIS. Some users, especially decision makers, emphasize for example on analysis without paying due attention or giving it necessary support, on data collection and processing. We can only have a good data analysis and interpretation only when we have a good data collection and data cleaning system in place. Therefore, each of the steps in the procedure has to be attended to, planned, monitored and evaluated. Therefore, the system is made of components each of which should work together to achieve our vision.

K. Manpower requirements/Structure: The manpower requirement for EMIS depends mainly on the amount of work involved. However, there are

important qualifications required. These are shown in the sample structure. Note that the sample structure is for a hypothetical country. No single structure may fit any one country.

1. As every unit of the ministry of education, EMIS needs a leader. A professional leadership that bring together all the components of MEIS, in attitude and spirit, is needed to achieve and effect the vision set forward – informed decision making. Such a leadership together with management should be able to bring together the attitude and behavior of all staff to be tuned to planning and policy needs of the ministry.

2. Under the management of EMIS we also need computer professionals – both hardware and software professionals. Computer Programmers and skilled

Figure 7

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                         ┌──────────────────────────┐
                         │           EMIS           │
                         │         Manager          │
                         │ (Management Information   │
                         │         Systems)         │
                         └──────────────────────────┘
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Survey Administration (Chief expert SA)	Operations (Statistician +IT)	Data Analyst (Statistician)	Information (MIS +SS)
Expert-1 Expert-2	HW SW	Exp-1 Exp-2	Exp-1 Exp-2

Encoders

Key: SA=Survey Administration, IT=Information Technology, MIS=Management Information Systems, SS=System Support, HW=Hardware, SW=Software

EMIS: Sample Structure

application package users are among them. Programmers are mainly responsible for writing computer codes for data entry and retrieval purposes as well as supervision and maintenance of the programs at the time of data entry and retrieval.

3. Then statisticians for data analysis and compilation of reports. These are also responsible for dissemination – communicating the results to users in an organized and effective way. They should have analytical power as well as ability to use related software packages.

4. The last block in the figure above shows the information support system. This section of EMIS, liaisons with users and gives information service to users. They share feedback with other EMIS staff and users. The section is also responsible for collecting, compiling and presenting feedback information.

The responsibility of collecting, distributing and binding of annual questionnaires, abstracts and reports also lie within this section of EMIS.

5. Finally, data entry clerks are needed. Their job is to enter data into the computer according to pre-prepared templates. In that regard they are responsible for inputting data into the computer including proofreading and data cleaning.

This is a sample structure meant to illustrate the general need in terms of manpower required. In practice, the size of the manpower required depends on the amount of work involved and hence, the structure differs from country to country. In some countries, a small unit of EMIS will suffice to carry out EMIS functions. For example a statistician can do both survey administration and data analysis functions together. However, in others more manpower may be needed depending on the volume of work.

L. Training: training is one of the essential components of EMIS. It is an all round and continuous activity that the management needs to pay greater attention to. It is an all round activity because the system works with each components working together to make the vision happen. These are steps starting from data collection through feedback and implementation. It is a continuous one because 1. The field of technology is changing fast, 2. The manpower turnover is high thus necessitating that a continuous training is maintained throughout in the long run. The general content of EMIS training could be summarized as:

- Survey administration including methods of collection data collection, instrument design, including content outline and layout, pre-testing the instrument, publication, distribution, and follow up.
- Systems development, programming including end-user computing and development of application software for data capturing and retrieval.
- Policy related data analysis and presentation
- Compiling reports
- Publication, distribution and dissemination
- Networking and communication
- Maintenance of both hardware and software.
- Documentation

- EMIS management and innovative leadership
- Planning and programming
- Monitoring and evaluation
- etc
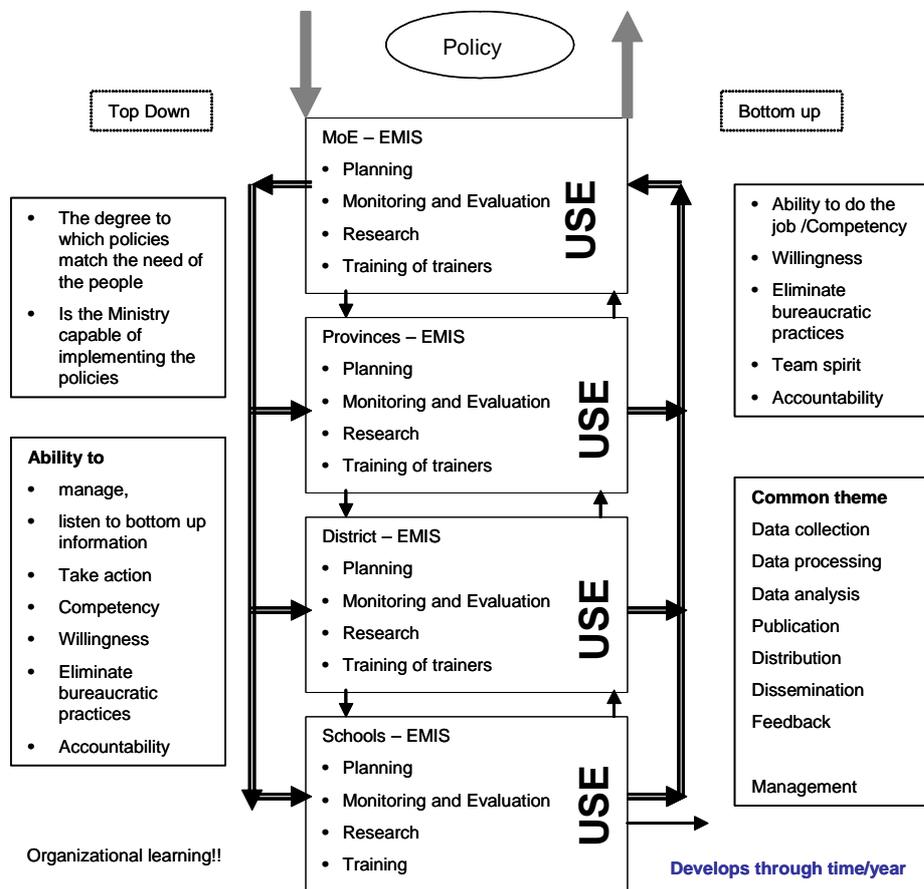
Some of these need long term training and professional specialization to develop sustainable in-house capacity. Some can be tackled in short term courses and through workshops and seminars. EMIS management should see where the gap is and assign staff for training as a reinforcement needed through on the job training and other means.

A better approach is to have a classified structure for training and development of a system for training of trainers. These can be classified as: Basic, intermediate and advanced. Not every staff needs advanced training. At the same time basic training alone will not be enough to handle EMIS functions effectively. Hence a need assessment for training need to be made both for EMIS staff and MoE staff prior to planning and preparation of scheduled activities. Advanced level training is required to be more effective and innovative.

Basic training: Basic skills is needed for all employees, not only EMIS but the whole ministry. The use of computers is new in many of our countries. Hence, basic knowledge of operating systems, word processing, spreadsheet programs, database operation skills, use of internet facilities are needed for all as much as possible. Moreover, self learning (individual learning) be encouraged to cope with changing environment.

Intermediate training: An intermediate training is organized for those who have basic skills but lack enough knowledge to fully apply their knowledge to achieve results to meet the goals. It may be arranged as the need arises. It is a big advantage for EMIS, for example, to upgrade the knowledge of data entry clerk who are able to learn more to the level of maintenance support like trouble shooting. A focused training, for example on the use of SPSS statistical package, can be given to statisticians, researchers and other experts engaged in data analysis and research.
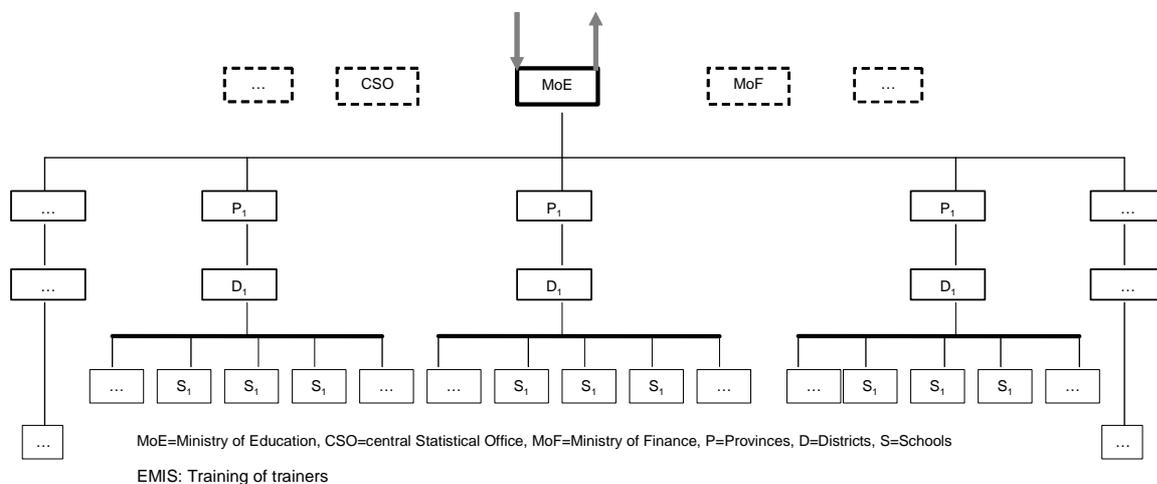
Advanced training: Advanced training is necessary to be self sufficient in major areas of application: EMIS management, data analysis, programming, networking, data processing. Such a move enables EMIS to be self sufficient in these areas. Moreover, the role of EMIS in research and development must be encouraged to attended more to the development of the system and management of changes in long run.

It is important to note also that the training program is given for EMIS staff at all levels of administration. The central EMIS has the responsibility to coordinate the training programs at lower levels: province, districts and schools. The best approach is the training of trainers.

Training of trainers: In large ministries, the central EMIS alone cannot coordinate the provincial, district and school level training programs. Hence, the best approach (strategy) will be for the center to train trainers at provincial level who can train trainers at district level. It is easier for districts professional to train schools in data collection processing and reporting as they have direct contact with schools. This of course includes training on technical skills needed in software, hardware, networking and maintenance of both hardware and software

programs as much as possible. It is important that the training be given on the job on continuous basis. With more emphasis given to the use of information in planning and decision making at different levels of administrative units. It is equally important to share information between departments within the ministry of education, and within provincial and districts offices.

The core target groups in this continuous training program should be the schools. Specifically the school head master, teachers and record officers with particular attention to those who deal with completion of school annual questionnaires. The more we invest in training at school level the better the information we can get. The core content of school level training must include records management, school level planning, monitoring and evaluation at school level, and the use of information for planning and decision making at school as well as all other levels. Most importantly an overall awareness of what and why we need to collect information in general. It is equally important to encourage the use of the collected information at all levels especially the school. This can be done through feedback informaiton to schools as much as budget allows.

MoE=Ministry of Education, CSO=central Statistical Office, MoF=Ministry of Finance, P=Provinces, D=Districts, S=Schools

EMIS: Training of trainers

The basics 'awareness type' training and methodology, in planning, monitoring and evaluation, research, and training of trainers should also be introduced to lower level administrative units in schools and institutions.

The central EMIS management can benefit by encouraging and practicing self learning and group learning by using available professionals in the office who are more knowledgeable. This is for the benefit of all. Cultivate culture of developing personal interest and willingness to exert efforts to learn and teach others in the office. A good practice is to have all professionals on board at all

levels in this in-house learning. Get them accept and appreciate the benefits of information use for development.

Self learning: self learning is one way of increasing skills in EMIS as the facilities and know-how are available within EMIS. The best way of learning is to consult and practice and practice again to develop one's own skills to the level of mastery and produce better results. EMIS should encourage the method of self learning by creating a good team spirit and mutual support at all levels down to school.

Group learning: Everyone in EMIS is surrounded by a group of professionals or outside EMIS but nearby. One knows better than the other in certain areas. Another good way of learning is to encourage and promote group learning with colleagues in the office and outside the office and birng in skills that enable produce better output.

Finally, it is the ability to use opportunities gotten from the ministry (top down effort), long term training, workshops and seminars and meetings, and the efforts made in EMIS to train its own staff (bottom up efforts) that are likely to show good results. Moreover, it all depends on both the top down management and the bottom up feedback service's willingness, understanding and competency to analyze problems correctly come up with a strategic planning and management to achieve a better outcome.

What is needed is the strategic planning and management that can identify gaps quickly and create situation for continuous learning in a changing environment and apply new skills to enhance further organizational learning.

M. Planning: Planning is important for any activity we undertake. Certainly EMIS is no exception. This is true, not only for data collection life cycle, but also every other activities such as, planning[3], monitoring, evaluation, training, research and all activities that happen to assist us in achieving our goals. Without proper planning we cannot do an efficient plan implementation or meet the deadline. Moreover, we can not learn effective ways of planning and plan implementation and achieve the high performance level desired of all the

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[3] Plan to plan

activities. Remember knowing what is to be planned is equally important as scheduling activities. The objectives are:

a. To develop an EMIS strategic plan for the year

b. To ensure a successful implementation

c. Achieve high performance that is sustainable over time.

It is important to closely look at the three simplified objectives above, and devise a strategy on how to achieve them. Our suggestion is to use the systems thinking approach and establish goals and objectives right at the beginning. We start with the future state.

1. What is our vision? Where do we want to reach? This is to be stated clearly in our plan document. Specifically we identify what we want to achieve by engaging in strategic planning.

2. The next step is to analyze feedback information taking into account the environmental conditions – the context in which we develop our strategic plan.

3. This is followed by analysis of the current state. What do we have today? This could be investigated in terms of manpower availability both in terms of quantity and quality. Available facilities (hardware, software, including networking facilities). A tour through *Survey administration, Data processing, Data analysis, Publication, dissemination and feedback status and identifying gaps that feedback to the next strategic plan period. The budget available that enables us to carry out effective plan implementation.*

4. Prepare detailed plan implementation program. This contains a list of activities, responsible person or group, time frame, expected output and cost estimate where applicable with each one clearly stated and documented.

In our planning and programming, activities are well detailed out and listed and used as a reference from time to time during implementation for monitoring purposes. This is one of those important documents for reference during evaluation. A well structured planning is, not only, easy to read and understand but also assist in monitoring and evaluation of the program.

It is important to realize that like every adult we learn by doing and in every yearly cycle we expect change or improvement. In planning it is useful to note

- The work process
- Plan to plan
- Effective implementation
- Check the implementation is done correct
- Take measures to use and incorporate knowledge acquired through the process
- Plan strategy to collect feedback information

N. Monitoring and Evaluation: monitoring is an important component part of our work. It is part and parcel of the EMIS activities to look into what was planned, implemented and what remains to be done. Monitoring is our tool to investigate into, see and learn not only what have been done but also what problems were encountered during implementation and with particular emphasis on how the problems were tackled. This paves the way for future enhancement of the implementation program. Bamberger defines monitoring as follows:

Monitoring:

> *Monitoring is a continuous internal management activity whose purpose is to ensure that the program achieves its defined objectives within a prescribed time-frame and budget. Monitoring involves the provision of regular feedback on the progress of program implementation, and the problems faced during implementation. Monitoring consists of operational and administrative activities that track resources acquisition and allocation, production or the delivery of services, and cost records[Valadez, Bamberger].*

Once again we revise our original objectives of the system and try to see and check if we are on the right tract towards achieving our original objectives. Whether we can produce the output as outlined in our planning and programming document on the set deadline and within given budget. Hence monitoring demands a regular and systematic gathering and analysis of information on the implementation of EMIS activities in the light of prior set objectives. Moreover, information on the management and administrative style used and the resources allocated is important.

It is important to note that is a collection of information in a systematic way in the hope of learning

- What has been done and in what way?
- What problems have been encountered during implementation and how we tackle them
- What lessons or 'best practice' to be learned for future implementation

With the goal of improving the functions of EMIS in today's a changing environment. In our plan the core elements (procedures) of EMIS function are laid out in detail showing the time frame for the expected completion date of the activities. Say three months later, we check what is happening with the original plan and schedule in relation to data collection, processing, analysis, publication, distribution, dissemination and feedback, including the management and administration of different activities. In other words we check that

The instruments of data collection are designed/reviewed with changes incorporated from last feedback information.

- The pre-testing of the instrument is done
- The instrument is published and the allocation to provinces, districts and schools is done
- Distribution to school is done and a follow up mechanism is in place to monitor the returns

It is important to delegate this important function to districts and free districts from other routines so that the monitoring of survey instruments be effectively done and reported to provinces who in-turn report to the districts. It is important to note that such a feedback of results to districts is absolutely essential. The districts in turn have the responsibility to give feedback to schools which often depends on the financial capability of the district offices.

In a decentralized system the data processing function is done at the province level. The provincial office is responsible for processing and distribution of the result to central office as well as district offices. The provincial offices are also responsible for hosting series of trainings for district offices and their own

training schedules from the center. These are the activities that are to be tracked and monitored in the process.

Data processing is another important function of EMIS. It has a lot of activities under it that require specialized professional qualification. Here we check whether the requirements analysis has been done[4], the data capture computer programs or modules are prepared and they are up and running. The software used – both back end and front end. An standby maintenance schedule and preparation in place. The necessary user manuals and specific training is given for data entry clerks. The data entry clerks are recruited and trained.

Data analysis is done from time to time. There are analytical outputs required for the output publications such as annual abstracts, quick references and indicators reports. A great majority of time is used in responding to users needs. This includes briefing to superior bodies, analytical feedback for planners and decision makers for both internal and external users, workshop training preparations, response to research needs etc. The role of monitoring function is to see to it that these analytical reports are produced. That these reports relate very much to the policy and overall development of the education section within the country. Hence, through the monitoring function we try to ensure that these analytical reports, at least basic indicators of education systems, are produced. Also check that the use of qualitative indicators is in place to support the quantitative outputs.

The are major publication for general use that EMIS produces. The annual statistical abstract is one of them. Some countries have also made an effort to produce quick statistical references. Many countries produce indicators reports, perhaps in bits and pieces. We encourage them that these products be published on regular basis. The role of monitoring is to see and check that these products are published. Current development has made it possible that we can reach out to many users by publishing our products on website. Abstracts, quick references, indicators reports and other ad-hoc reports and research results can be published on the web for those users who are not victims of the digital divide.

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[4] It could be that requirements analysis was done earlier and hopefully documented. The monitoring function looks into those documents and checks on the modifications, or other additions based on the feedback.

Dissemination is the word we are using to mean "*reach out to users as much as possible*". It entails the spread of educational information for all active users and potential users. This is done through training, briefings, distribution of publications and products and other formal and non-formal discussions.

Feedback is the reinforcement to the system. It is the information collected as a result of the information put to use. Such feedback information can be collected through a clients' service within EMIS unit of the ministry. Users come to the ministry asking for information. These are government and non government institutions, civil societies, students, teachers, planners, researchers, donors, private organizations and individuals

Finally monitoring the management style and administration within EMIS is to be looked at. These include the type and content of training and its relation to the need of the users, the communication, collaboration, self learning environment and assistance of staff within EMIS and outside it. Moreover, the network of communication between provinces and districts down to school is to be looked at including the role of the center the part played by the center to strengthen the lower tiers.

What is planned? What is actually done? However the is the gap? Did we meet the deadline? If not why not?

Evaluation

> *Evaluation is an internal or external management activity to assess the appropriateness of a program's design and implementation methods in achieving both specified objectives and more general development objectives; and to assess a program's results, both intended and unintended and to assess the factors affecting the level and distribution of benefits produced [Valadez, Bamberger].*

Evaluation is basic for every activity/task we undertake. EMIS activities are no exception. Evaluation can be done internally by EMIS in the form of self evaluation or externally or by professionals from the user community. In this manual we our emphasis is self evaluation by EMIS team with the objective of improving implementation and management style to meet the desired objective.

This refers to where we look back to what we have done, and see the strengths or weaknesses, what to modify and extract out 'good practices' for further implementation that ensures better performance. Strengths are carried to the corrected with the aim of enhancing accomplishments. Moreover, new ideas and innovations are assessed and followed and studied and put to practice in this changing environment.

What to evaluate? We look at all the activities starting from data collection to feedback gathering as indicated in the appendix, and find out what we have completed, and test our implementation procedures and see if we have arrived at the desired output with effectively and to the best of our satisfaction. Special attention will have to be given to the problems encountered and the method we used to solve them (if we have solved them). Hence, the short answer to the question is we evaluate the functions of EMIS?

For whom is the evaluation done? Evaluation can be done for ourselves – to learn from mistakes and improve implantation procedures or for the superior body who may demand such an evaluation report. It may also be done for external users such as donors. In our case we do such evaluation for the sake of our EMIS development. The result of which may be used by others – superior body or user community.

When should evaluation be done? Evaluation can be done prior to the beginning of the school year, middle of the year, or at the end of the school year. The first and the last are the important ones. The first one is the source of information for feedback from the past in which such information is discussed and incorporated to the future implementation – best example is the data collection instrument and the feedback obtained from information services dissemination function of EMIS which may be going on parallel to the preparation of the instrument(s). The mid-year review is important for compiling feedback that could go into the analysis and publication of the outputs – reports of different kinds. The end of the year marks a compilation of the first two reviews and analysis of which the synthesized summary can be incorporated to future implementation.

How do we evaluate? Evaluation is part of the annual plan. It has an instrument of data collection, and a time frame or deadline for review. Hence, information is collected in different forms as part of the implementation program both as part of the monitoring process which latter on is used for periodic review. Hence, we look into the EMIS activities one by one from data collection to feedback review including the management and administration style as well as the progress and success and failures that have happened. Instruments of data collection both for statistics and feedback information, outputs and products, publication, reports, workshop proceedings and review reports and other useful notes and documents are to be assessed.

- Improve an overall performance EMIS functions
- Explore choices that are available to us
- Learn lessons and manage our work better for which we accountable both to develop it further and report on from time to time

Evaluation can also be done externally, perhaps from other ministries or government agencies or donor community as an outsider's look into the EMIS functions in relation to other activities within and outside the ministry of education. This may be done, often indirectly, perhaps in three, five or ten years time. However, it is more unlikely that an external evaluation is done unless perhaps taken up in relation to other research activities, or other project evaluation programs. The following general outline of the evaluation work process may assist in planning the evaluation.

- Clearly state why the evaluation is required and who uses the outcome of the evaluation
- Recall the overall goals and objectives EMIS
- Identify EMIS activities fully: the methods used for
  - Data collection
  - Programs used for data capturing and processing
  - Analysis made
  - Publication produces ana mechanism of distribution

- Strategy used to collect feedback information
- System in place to render information services to users

- Determine if program activities are sufficient to achieve the set objectives
- Design a data collection and capturing methodology including analysis and storage
- Collect data checking at every stage if the methodology used is leading to the desired output
- Process and apply data analysis needed
- Organize reports in such a way that it can be used for decision making. Prepare summary reports and main reports for different users
- Ensure all users of the evaluation result receive copies of the report
- Develop a plan to act on the results of the evaluation

O. Decentralization: In the context of EMIS management, decentralization is defined as the share of authority, responsibility, accountability of *data collection*, *processing*, *analysis*, *publication*, *distribution*, *reporting and dissemination* of information to lower levels of administrative units. In most literatures, I have read about decentralization, the word transfer is used instead of the word share above. This eliminates the chances of working together, assisting each other, learning from each other etc which has to exist in order to have a proper functioning EMIS. We are sharing the work load between the center, provinces, districts, schools or lower down as appropriate.

It is important to note that we work together, assist each other, discuss together and solve problems together for common end. Not all provinces or districts have sufficient number of equipment, qualified manpower capable of doing the required job nor the capacity to develop data capturing and retrieval programs. Some lag behind and some are relatively well of. Mutual assistance is necessary. It needs competent management to coordinate the work and render assistance to those that lag behind both at provinces, districts and school level. Hence, the role of the center is to standardize the data collection instrument and develop a standard data capturing and retrieval computer programs that can be shared by

provinces and districts. This is useful not only for ease of use and enhancing data comparability but also share of resources and cost reduction.

The provinces can collect more than required by the center. However, it is to the advantage of all that they use the same format for data collection, processing, analysis and dissemination of information. Imagine a situation where some provinces use different software for data capturing and retrieval purposes from other provinces and the center. It is difficult, if not impossible, to assist these provinces in any way and share resources. Moreover, it takes time to relate reports coming from these provinces and obtain an aggregate at higher level. Furthermore, it takes time to aggregate the result and with less accuracy.

It is also important to note that the work of one is not complete without the completion of the work of the other. Imagine a situation where all the districts have reported on time but one remaining behind. The work is not complete at the provincial level. If any one particular province is missing or lagging behind, the work completion at the national level remains incomplete. It means the report has delayed, and hence the annual plan preparation is also delayed. Moreover, one of the objectives we started with - to make accurate and timely information available to users - is not met.

Decentralization of EMIS to lower levels also means, as was mentioned above, sharing of authority, responsibility, accountability of *data collection*, *processing*, *analysis*, *publication*, *distribution*, *reporting and dissemination* of information to the different departments within the Ministry of education – horizontal distribution of information for users. It is EMIS's responsibility to asses the demand and

Top Down flow
- Demand/Use
- Guidelines
- Infrastructure
- Training
- Information dissemination

Strategy
- Training of trainers
- Step by step build up of the system
- Team work at all levels

Policy

MoE/EMIS

Provinces

Districts

Schools

Challenges
1. Equipment
2. Manpower
3. Capacity building

Training
- Monitoring and Evaluation
- Inventory
- Documentation
- Maintenance

Risks of decentralization
1. Undermining central issues
2. Increased disparity

supply of information for each department and division of the ministry of education. This is quite often forgotten, simply because the emergence of EMIS
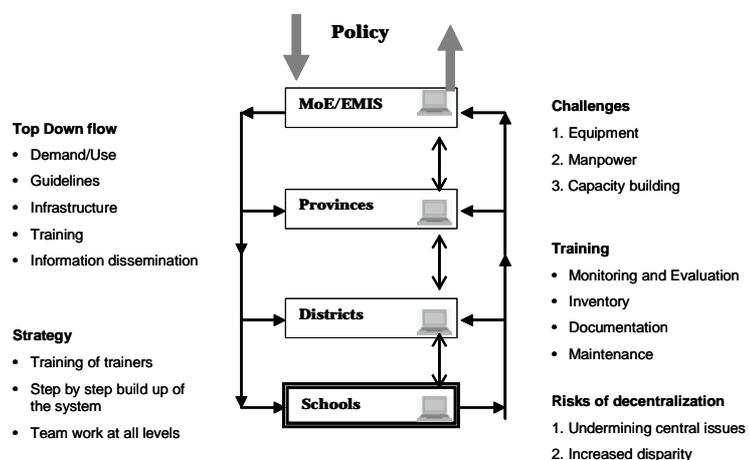
as center of information and training is relatively new in Sub-Saharan Africa. Sufficient manpower, both in quantity and quality is not available or fulfilled to date in many African countries. The importance of establishing such information centre within the ministry of education is not fully understood.

The above figure shows our vision in relation to decentralization – in which provinces, districts and schools are networked. In such set up data capturing is done at school level and output sent to the center electronically and provinces and districts retain copies for their own use. However, this is a long range vision which cannot be achieved overnight. What is important is decentralization can be done step-by-step. That is, data entry and retrieval system can be decentralized initially to provinces. This takes sometimes after which further decentralization to districts can be considered. It is expensive to fulfill manpower, materials and facilities at all levels at once.

Advantages

1. The routine workload at the center, data collection, data entry and monitoring of returns will be lower. The staff at the center can now use the available time for data analysis, training and other more innovative activities. The summary statistics will be collected from provinces electronically, either on diskettes or email facilities where applicable.

2. The work of EMIS will get more attention and more coverage. Provinces can now collect more data on top of what is required by the center and use it for their own advantage.

3. It is hoped that the quality of data collected will improve. However, more technical support and awareness training has to be given to provincial staff through regular long term training in which details for the working procedures and problems are addressed.

4. It is hoped that provinces will give better services for provincial level information users and central level reporting by increasing their own level of awareness through time.

5. The center will have more time to coordinate the work or provinces but also more time to train the provinces. Assess the work of the provinces

and assist the provinces in sharing technical expertise and introducing new innovations.

Disadvantages: The main disadvantage of a decentralized EMIS is, that provinces may underplay the role of central standard data collection instrument and data capturing and retrieval programs, and try to modify the content or the layout of the instruments. This, as we discussed above, to the disadvantage of both the center and the provinces. Therefore, it is important to take up the issue and resolve the problem through discussion.

P. Research functions: The basic statistics we collect regularly every year will to not be enough to provide some of the information needed for decision making and planning purposes. Moreover, not all can be collected on regular basis. Additional information need be collected through pilot studies and research undertakings.

Moreover, the analysis we made on regularly collected data may lead to further issues that need to be studied closely. Hence, EMIS management should be prepared to undertake research activities that throw more light on the issues that need further clarification and investigation that leads to fulfillment of our vision.

EMIS, by virtue of the facilities, and skills available, has the responsibility to assist other experts and analysts in research data processing and training of experts in software skills used for data analysis and research endeavor.

Moreover, engagement in research is one of the methods used for strengthening EMIS and learning more not only of the work process in EMIS but also further development and understanding of policy anchored information services.

Q. Establishing EMIS: Many countries in Sub-Saharan Africa, have already some form of data collection system in place. In the last decade, through NESIS capacity building program, awareness has increased to strengthen education information system within the ministry. Many are working towards obtaining, at

least, basic indicators of education system. Hence, the demand for use of information for decision making has lead to the need for strengthening of the education information system within the ministry. Many countries are asking for a guideline on how to go about establishing a strong center for organizing information for the management of education. The following points are useful in this regard

1. *Dreams*: start by formulating your vision as to what you what to achieve. Write in short and concise form what you want to achieve in the future. Ask yourself what is EMIS? Why do we need it? In other words have a vision statement. It might be necessary at this stage to learn from other countries experiences.

2. *Scanning the environment*: Study carefully and with purpose the environment in which you are working. The ministry and its departments and sections of the ministry in relation to what they are doing, what they want to do in the future, etc. Identify what role EMIS can play, and what remains to be taken care of within each department and sections. EMIS alone cannot be held responsible for all. Every department, sections, provinces, districts and schools share the responsibility. This is a question of capability both in terms of quantity and know how of the subject matter for which information is to be collected. Moreover, have a general knowledge about the social, political and economic situations. Some knowledge about the layout of physical infrastructure and facilities is also useful. Assess basic information as regards the level of digital divide in and around your office.

3. *Feedback information*: collect and compile feedback information that relates to your vision statement. This is very important but often forgotten. Users say something about issues that relate to your vision which need to be taken into consideration for further refinement of your plan of action and learning process.

4. *Today*: Carefully assess what you have today in terms of plan and plan implementation, strategy for feedback information, training, monitoring mechanism, overall management, manpower, facilities, etc. The strength, weakness, opportunities and threat of the current situation. The level of coverage of activities, problems and successes achieved to date. Moreover, the budget available to carry out the plan.

5. *Put the rubber on the road*: by now we have set our vision statement, compiled feed back information and have assessed the environment, and the strengths and weaknesses of the current situation. We have also identified the budget available including the manpower and materials necessary to formulate the plan. Formulate a plan carefully paying attention to every activity that needs to be done. Included in the plan are such important functions as monitoring mechanism, strategy for collection and feedback information.

6. Ensure successful implement of the plan. Review the plan on yearly cycle basis.

Success factors: In addition to the steps outlined above, the following points are considered as success factors for establishing/strengthening the EMIS system of the ministry.

❖ Include core professionals in EMIS and major users in the whole process. It is true '*people support what they help create*'

❖ In the whole process the user is at the center of our focus.

❖ Aim at high and sustainable performance level at all stages of development process through self study and team learning.

❖ Use feedback information effectively and efficiently for continuous learning and enhancements

❖ Encourage and assist departments within the ministry who collect data for their own consumption to make use of information in the decision making process.

❖ Assist and work together closely and establish a regular contact and communication with provinces, districts and schools.

❖ Organize a regular training program for all stakeholders especially the school.

R. Challenges: Education Management Information System is a relatively new concept arising from the need to embark into a more coordinated form of management for information on education. All ministries of education had what they call "statistics" section within the ministry responsible for collection of education statistics. It is this section that is being transformed to EMIS to give wider look and more coordinated approach to educational information from

schools, departments of the ministry of education and other educational institutions. EMIS makes effort to compile a more comprehensive and policy oriented educational information.

With the growing demand for information and volume of work, the demand for facilities such as computers increased tremendously. This in turn has given rise to more trained professional manpower in computing and use of computer knowledge on top of the already existing need for professional training in statistics and data analysis capability. However, building EMIS has never been easy for countries in Sub-Saharan Africa especially among top decision makers. There are still challenges ahead.

Awareness: One of the main ideas of having a coordination unit for information within the ministry of education is for the enhancement of the level of user awareness among planners, decision makers, researchers, experts, decision support systems and administrators in the ministry of education. Although a substantive work has been done so far, there is a long way to go when it comes to the level of awareness on the use education statistics in Sub-Saharan Africa. The use of information for decision making has not taken root yet.

Budget allotment: One of the measures or indicators of the level of awareness is the willingness, on the part of decision makers and planners, to allocate necessary budget for developing information system within the ministry on the one hand, and willingness and dedication on the part of EMIS staff on the other. Budget for acquiring new technology, mailing data collection instruments to schools, undertaking research and surveys to supplement statistical results are some of the points worth mentioning in this respect. Willingness to learn on the job and be innovative and create future vision among EMIS leadership is at times lacking. Dedication to sacrifice time and perseverance to initiate dialogue with decision and policy makers in the hope of achieving future visions is equally lacking among statisticians and computer professionals working in EMIS.

Personnel shortage: Trained professionals, both in quantity and quality, are in short supply. Long term training for professionals in EMIS and budget for in-house training of EMIS professionals and workers is scarce.

Overrating of the capacity of EMIS: The attempt to create a unit to coordinate information systems for education, coupled with the emergence of fast growing technology, has led to a need, both for short and long term training. Moreover, professionals in EMIS need to learn themselves before they can produce. This takes time. This is not quite realized by decision makers within the ministry. Furthermore, enough personnel are seldom assigned for EMIS unit of the ministry. However, users demand more output from that they can produce.

The need for continuous training: In the light of fast changing technology and the very professional nature of the EMIS work, EMIS staff is engaged in a continuous learning environment and implementation of the knowledge gained through time. These needs and efforts are often overlooked by decision makers.

S. Communication and information services: Communication is one essential part of the EMIS management system. Communication here refers to ability to convey results to users in a simple and understandable way. It takes two ways to communicate. The sender and the receiver. The objective in communication is to get the intention of the producer across to the user as understood by the sender and make sure that the receiver has got it right.

This implies that the sender (in this case EMIS) has to have an established objectives, planned and well organized way to communicate yearly analytical findings from cross sectional analysis or time series finding to receivers(users of all kinds) and motivate them in the use of and appreciation of information decision making and planning process. The purpose of such motivation is, among other things, to bring about and effect change within the ministry of education. A positive change that brings about development within the organization.

The medium of transmission can be
- A written report
- Annual abstracts
- Indicators report
- Electronic transfers

- Briefings
- Individual or group discussion
- Workshop presentations
- Telephone conversation
- Email communication
- etc

Accurate communication takes place when the receiver attaches the same meaning as intended by the sender. Hence, more importance is given to the content of the message passed to the user.

EMIS managers need to communicate

- The objectives of EMIS to policy and decision makers and establish the success of the vision of the unit.
- Develop a strategic plan to achieve these objectives
- Organize and train staff to realize the objectives and goals of EMIS. It is not a one man show.
- Create, conducive environment to lead, direct and motivate EMIS workers to effectively communicate to users.

Moreover, managers need to communicate yearly findings to internal and external users. Specifically to departments, sections, decision support systems, provincial and district managers, individuals and other organizations and highlight the findings supportive to the overall objective of the ministry of education.

Communication starts with a planned idea to pass on to the user in such a way that the user understands. This implies that the professionals in EMIS need to know both what the different users need and a good way of passing the information to these users.

Information service refers to attending to users. This can be explained in two ways

1. Giving support to information seekers. Users contact EMIS unit of the ministry requesting for varieties of information. This can be individual

school information or different kinds of aggregate data or analytical reports. The EMIS center has the responsibility to cater for such information and arrange the best way to pass on to the users.

2. Making known the results of findings of the annual or time series information that should be made available to users by using such occasions as workshops, meetings, group discussion or ad hoc reports. It is to the advantage of both producers and users to know the outcome of, for example, the annual survey analysis, research findings, student performance level, teacher qualification etc that support decision making.

T. Documentation: One of the most important things is documenting the results of our work. This is often forgotten or overlooked. Simple reports, abstracts, policy papers, mechanism for feedback information collection, methods of monitoring activities, evaluation reports, technical and training manuals, hardware and software manuals etc. all have to be documented not only for our own reference at a later stage but also for the next generation. This saves time, money and manpower. When results of our work are properly documented, future generations will not only save time but be able to build on what we have done and others will learn from what has been done. Moreover, they will have no need to repeat what has already been done but continue production based on what is existing. Therefore, let us reserve the outcome of our work for future professionals for them to take and use to build even better system. Give copies of your reports, abstracts and policy papers to libraries and other documentation centers. Encourage planners, decision-makers and users to use the resources and provide feedback. This saves our time as users can find our products in the libraries within the ministry of education so that users can have access to it and other documentation centers. This is especially true for university libraries as the large number of students come to EMIS office seeking information.

a. All records be kept in a safe, and easily retrievable place. Such records include
   - Data collection instruments

- Software and hardware manuals
- Abstracts
- Reports of various kinds
- Planning documents
- Feedback information records
- Evaluation reports
- Indicators reports
- Physical and computer files of various kinds

b. responsible person should be assigned to handle records management

   c. Clear description of where and what records are there, how they are kept, and where so that access in easier.

U. Summary and Conclusion: Establishing and strengthening EMIS is effectively achieved when the top decision makers realize the importance of information systems development for all the functions in the ministry and commit themselves to establish or strengthen the EMIS system. Moreover, an able, dedicated and willing management of EMIS is required that can give necessary leadership in the development of an information system within the ministry of education. Hence, the commitment of the top decision makers and dedicated and willing leadership cadres of EMIS are needed.

A conscious management is required that can coordinate resources and personnel and provide leadership with vision and explore the environment for more by using essential feedback information. Hence, a competent manager is required.

Moreover, the management that is able to take on board all stakeholders, especially the users, and make a dialogue on continuous basis of what is required and what can be achieved both in the short run and long run. The management has also responsibility to take on board EMIS staff and work with them to realize the importance of users in the play in an effort of establishing and strengthening an information system within the ministry and encourage them to pull their efforts together and work, learn from one another and

innovate in the teams towards a common goal. Hence, user focused output and good participation of EMIS professionals are needed.

The ability to use the systems thinking approach of looking into the future, and work back through the feedback information, current state of art, and throughput and planning with good knowledge of the environmental factors taken into account. This applies to all the procedures discussed above of data collection, data processing, data analysis, publication, dissemination, feedback, planning, monitoring and evaluation, research studies and all relevant activities that strengthen EMIS within the ministry. To have a clear vision or dream of the future is essential.

Training of personnel in EMIS and outside EMIS but within the ministry of education is a sine qua non of success. Learning from our own success and failure is a feedback to our own knowledge which will feedback to effective problem solving but at a higher level. This is a usual practice for a learning organization. This allows the management and the team as a whole to tackle problems leading to mastery over the skills needed to achieve the goals.

The role of EMIS is to strengthen national capacity to provide accurate, timely and relevant information for policy makers, planners, decision makers, and decision support systems. In order to be able to do that, EMIS needs to develop ability to

  a. Build a sound vision to develop an information system that supports the overall development of the education system.
  b. Work and dialogue with users of information and learn from them on continuous basis.
  c. Plan the planning of change management effectively, implement the plan and develop ability to learn in the process for the whole personnel in EMIS and users community.

Quality of the products we generate has a bigger impact than we expect in catching the attention of users and draw them towards the information use. The more it is used the better the demand can grow. Moreover, the better the use of quality information, the better the decisions made and hence advancing the

overhaul development of education. Hence, the EMIS leadership has to aim at and prove so that the quality of all components of the system are maintained. Without quality output in each of the components: survey administration, data processing, analysis, publication including distribution and feedback information, personnel management, training, planning, monitoring and evaluation, review and research, good quality of information services, quality of the whole system cannot be achieved.

It is important to realize that continuous training is one of the success factors in strengthening the EMIS system. In view of new technology that is changing our environment and increased demand, it is imperative that skills development, training, and innovative leadership be practiced.

Appendix 1

	Activities	Time schedule	Responsibility	Cost estimate	Expected Output	Expected Outcome	Remarks
A. Survey administration							
1	Needs assessment						
	Instrument design/Review						
	Pre-testing						
	Re-design/review						
	Publication						
	Distribution						
	Follow up						
B. Data processing							
	Requirements analysis						
	Program design/review						
	Testing						
	Implementation						
	Data entry						
	Data cleaning						
	Maintenance						
C. Data analysis							
	Requirements investigation						
	Planning the analytical framework						
	Draft content outline and dummy tables						
	Collect and compile source data						
	Compile report						
	Edit report						
	Evaluate the report						
	Finalize report						
D. Publication							
	Planning a publication						
	Compile						
	Process publication						
	Publish						
E. Distribution							
	Identification of main users						
	Prepare/update users' list						
	Mailing						
	Web posting						
F. Feedback							
	Prepare feedback data collection format						
	Feedback data collection						
	Review feedback information						
	Incorporate feedback information						
G. Evaluation							

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