Education policies and strategies 5

Information tools for the preparation and monitoring of education plans

L. Carrizo, C. Sauvageot and N. Bella

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Preface

This is the fifth volume of the "Education Policies and Strategies" series launched by the Division of Educational Policies and Strategies of UNESCO. Far from excessive theorisation, it is, first of all, a compendium of good professional practices. With the themes it covers, the Division of Educational Policies and Strategies aims to share its experience, not only with education planners, but also with the wider group of people who are interested in the elaboration and the implementation of education policies and strategies. This work is the fruit of long years of experience acquired through fieldwork in numerous countries and in varied socio-cultural contexts.

Devoted to "Information tools for the preparation and monitoring of education plans", this issue is addressed to specialists in the field of education information systems as well as to policy-makers and education ministry officials concerned with improving their knowledge of methods and tools required in setting up development plans and monitoring their implementation.

An information system is the basis of management, planning and evaluation of an education system. During the education management process, the information system should inform the different actors and partners on the state of the sector, its internal and external efficiency, its pedagogical and institutional operation, its performance, shortcomings and needs.

Most countries develop an education database using the results of school census and/or surveys that are carried out on an intermittent basis. These data are published in bulky statistical yearbooks, often raw, fragmented and without analysis. And yet, policy-makers and other actors in management and planning need easily understandable and interpretable data. These should be supported by in-depth analyses on the functioning of the system, that help in policy formulation, planning of relevant actions, and in monitoring and evaluation of the latter.

Because the needs for information are varied and becoming increasingly complex, a solid information system should be as complete as possible. It

should cover all the needs and areas for information and not only aim to collect, store data and process information but should also help in the formulation of education policies, their management and their evaluation.

The Framework for Action on Education for All, adopted in 2000 during the World Education Forum in Dakar, Senegal, has defined six goals for the international community to achieve by 2015. To this end, it invited all governments to develop or strengthen existing national action plans by 2002. These plans should be integrated in a sectoral framework and within the global national development policies. To take stock of the current situation, identify problems and needs in order to put forward new development strategies, such plans should be based on a precise diagnostic of the education system.

In conformity with this Framework, governments and the international community have committed to regularly monitor the progress made in pursuit of the Dakar Goals. Such monitoring presupposes the actual existence, at country level, of a reliable and complete education management information system (EMIS). The unfortunate reality however is that there are still many countries that do not have such information systems.

Through this publication, UNESCO intends to make a methodological and technical tool available to countries to enable them to better prepare and monitor their education development plan. This publication contains a computer programme package to facilitate the setting up of an education management information system. One of the characteristics of this tool is that it could be adapted to the specific situation of each country. We hope that this publication will provide each country with useful elements to help consolidate the elaboration or the implementation of national action plans for Education for All.

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Contents

1. Introduction

1.1 General Introduction

The year 2002 marked the first milestone of the Dakar Framework for Action which was adopted during the World Education Forum, held in this city from April 26 to 28, 2000. Bringing together participants from more than 150 countries and representatives from 160 governmental and non-governmental organizations, this forum represented the end of the first decade of Education for All (EFA) which began ten years earlier in Jomtien (Thailand). It was an occasion to review progress in basic education world-wide since 1990.

Following rather mitigated results, countries and the international community at large present in Dakar reaffirmed, through the adopted framework of action, the main objective of access to education for all of the Jomtien World Declaration, and defined six EFA Goals to be achieved by 2015. To this end, The Dakar Framework for Action requested all governments to assume the responsibility for developing or strengthening existing national action plans by 2002. These plans are to be integrated within a wider sectoral framework as well as in policies and programmes for development and in the fight against poverty. They are to be developed in a transparent and participatory process that includes all stakeholders, notably, representatives from civil society.

The preparation of any plan is a complex and delicate exercise. Like any therapy, a plan should be based on a precise and exact diagnosis if it is to be effective. The latter is indispensable in the process of planning: it makes it possible to take stock of the state of education, and identify problems through a detailed and critical analysis in order to be able to propose solutions. In other words, a diagnosis enables the identification of needs, which the plan, through the definition of new strategies, is supposed to meet.

The definition of objectives, the choice of strategies and policy decisions should be based on objective data, which do not only give an idea of the functioning of the education system, but also help in planning, management, and evaluation. The majority of countries have an updated education database as a result of a

more or less regular school census. If the quality and reliability of the collected data are not always perfect, their relevance and their usefulness for the definition of policies are always indisputable [1]. The latter are becoming increasingly complex and should imperatively be supported and guided by a solid information system which integrates all the information needs of an education system[2].

However, in some countries where data are available thanks to education management information systems, policy-makers hardly use them to guide education policies. This is partly provoked by the problems of presentation and dissemination of statistical information. In fact, with some exceptions, the data are published in heavy statistical yearbooks, in its raw form and without any accompanying analysis. And yet, policy and decision-makers and other planning managers need clear, easy to interpret comprehensible documents, accompanied by relevant analyses on which to base their policies.

Thus, the objective of an education management information system (EMIS) is not only to collect, store and process information but also to help in education policy-making, by providing relevant and accessible information. EMIS was originally designed to be a management tool but is gradually being perceived as an indispensable tool and support system for the formulation of education policies, their management, and their evaluation.

1.2 Presentation plan of this document

This practical guide presents first and foremost the different objectives of EMIS for a country.

It then attempts to describe the design, the fields covered and the collection process of EMIS. Particular attention is placed on indicators, which are an essential element of EMIS particularly for the design and monitoring of national action plans.

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[1] Claude Sauvageot, *Indicators for educational planning: a practical guide*. Paris, UNESCO/IIEP, 1996. (Second edition in collaboration with Nicole Bella, March 2003).

[2] Khadim Sylla, *Decentralization and education information system*. Paris, UNESCO/IIEP (to be published)

Finally, it describes the different stages of a functioning EMIS, while taking into account the conditions in which it is set up.

In each part and more especially in the final chapter, the subject relies on concrete examples which illustrate the general presentation and operational aspects of EMIS.

2. EMIS: its objectives at country level

The setting up or the strengthening of an information system is based on a simple premise: all systems, all organizations whatever they might be, have to produce information to inform on their condition (and their characteristics), their functioning and their results. Without data, no system can function rationally, and consequently no operational decision can be taken.

The education system is not an exception to this rule. Indeed, the development and the growing complexity of education systems and the needs for regulation and coordination which they require, make information one of the main elements of the administration, management and planning of education[3], providing in this way the foundation for decision-making at every level of the system. The education management information system (EMIS) is a sub-system of an education system whose aim is to collect, store, process, analyze and disseminate information. Its purpose is one of providing the basis (operating system in charge of carrying out daily activities) and the summit (decision-making system, the organ in-charge of defining objectives and strategic choices) of an organization with information and knowledge, for informed decision-making.

At the root of all information systems is the question of the purpose of the information to be collected: in order to manage and keep the education system in check for example, for the definition of priorities, the planning and formulation of policies, and finally for the follow-up and evaluation of the latter. In other words, the education system is composed of a multitude of interacting actors at different levels who need to be informed on the status of the system, its achievements and performance, its needs and shortcomings. Although interacting with one another, these actors have different and varied information

[3] OpCit, Sylla p.30.

needs which the information system should take into account and respond to appropriately.

For example, while the pupil is in a context where the information needed will refer back to questions about the content of education and methods of evaluation, the teacher will more likely be concerned with information of a pedagogical nature such as the curriculum, etc. In the same manner, the planner will be preoccupied with statistics and other indicators of education, while the policy- or decision-maker would wish to have, in addition to education data, the social, economic and demographic information, and to know the political context. This range of information falls within the jurisdiction of other information systems in addition to that of the education system per se, and are linked by a manifold of complementary relations.

The role or rather the challenge that EMIS is confronted with is to harmoniously integrate all these sources of information indispensable to the tasks of management, to research and planning of education and, to provide them in a synthesized manner to the users. It is subsequently necessary for the information system (IS), whose key word is synergy, to provide a global and systemic vision; a vision capable of ensuring the evolution and adaptability of the entire system[4].

Therefore, as one can see, the design and/or the strengthening of an information system should necessarily build on a preliminary phase of identification and analysis of information needs, taking into account not only the diversity of management tasks, of planning, of monitoring and evaluation, but also the different administrative levels (table 1), and the decisions of the actors of the education system, in order to meet the criteria of efficiency and relevance. What type of information is needed and why[5] ? Who needs this information and knowledge about the education system? These are the type of questions confronting the education system and to which EMIS should respond accordingly.

We can therefore draw a major inference: the information produced by EMIS should be <u>users-oriented.</u>

[4] OpCit, Sylla p.31.

[5] The type of information required typically deals with inputs and outputs of the education system as well as with its environment.

It is important to emphasize this because countries' statistical services traditionally produce data from a "producer's" point of view. They do not often consider information needs and the uses and purposes that collected information could serve. They hardly ever approach other users services and scarcely ever discuss the content of questionnaires and disseminated results.

This need for collaboration, discussion and exchange is imperative because it is one of EMIS's key factors of success.

In summary:

An Education Management Information System (EMIS) should generate information for users in the following essential fields:

- Management and administration of the education system
- Research on and planning of the education system (macro and micro)
- Monitoring and evaluation of the education system

2.1 Management and administration of the education system

If it is true that the necessity to collect, process, analyze and present data in the right manner is more than ever important in guiding decisions and in helping the elaboration of education policies, it also remains true that the first aim of an education management information system is, as its name indicates, to help manage and administer the education system by basing itself on modern management tools. The latter help it to generate multiple routine data and operational information such as, trimestrial, monthly and weekly records of the management and control of financial transactions, the presence and movements of personnel and pupils, the pay slips, results of tests and examinations, etc. Such information is particularly important for managing education activities at the local level and school level.

Management means control and verification of the system in order to detect shortcomings and weaknesses. Does the education system have enough financial, physical and human resources to operate correctly and hence produce the expected results? Does it have enough pupils and does it sufficiently respond to the need for education? What education do they offer them and with what success? The information generated by EMIS makes it possible not only to answer these concerns, but above all to control and evaluate the internal and external efficiency of the education system.

It is thus indispensable to ensure that the physical and financial resources invested in the system are not wasted but optimized in order to achieve better quality and efficiency in education (internal efficiency which indicates the way resources are being used - the process - to produce results) and, that the results meet the wider needs of society. In other words, if the MIS is determined by the need to be aware of the status and functioning of the education system, it also allows the latter to be accountable to its users.

There is an interdependent relation between EMIS and the management system on which it relies. Thus, if EMIS helps to manage the education system better, the management system of education inputs whose tools it uses, feeds it in turn with necessary information for the planning and improvement of the latter.

2.2 Research and planning of the education system

The need to gather data, to undertake sector research and thematic studies, to assess and evaluate the efficiency of current programmes, to explore the future in order to facilitate a wider debate on these issues is more than ever a determining factor in guiding decision-making and elaborating education policies[6]. The preparation of an education plan is an exercise, which requires not only specific skills, but also the availability of reliable and relevant information, which reflects the exact situation of education in the country. In this way, EMIS can feed reliable data to different simulation models allowing reflection on objectives defined for the medium and long term.

To analyze the situation or set up a diagnostic is a necessary and fundamental step in the planning process. In fact, how could one define objectives, formulate policies and strategies without knowing the present and past situations? In other words, for a plan to be effective, it should be based on a detailed and critical analysis of the situation, identifying the problems and causes, on which new policies and programmes to be implemented are supposed to act. Consequently, the choice in matters of education policy and planning should imperatively be made in the light of a solid information system which makes precise, relevant, reliable and updated information available to education managers and planners, and more conclusively for decision makers.

Because of a weak IS, most education planning efforts still have little impact and do not always guide the fulfilment of their objectives in an efficient way.

[6] Walter W. McMahon, *An efficiency-based management information system*. p. 5

One of the reasons often put forward is the absence of a link between the established diagnostic and the defined strategic policies and choices. But more frequently the explanation could be found in the inadequacy, indeed in the lack of relevant data and information on which decision-makers can base their policies.

In fact, if statistics, documentation or information services exist in almost all education ministries with a quasi-systematic collection of school statistical data, the decision makers often have to content themselves with fragmented and obsolete data.

Moreover, with some exceptions, the education data are not published except in the form of bulky reports with raw data and incomprehensible statistical tables which lack qualitative analysis. A large portion of collected information remains untapped. For example, when the information system includes, other than the education data, contextual information coming from other sources, these data are rarely used because of the lack of analytical and research capacities. So, how can one formulate targeted and efficient actions and appropriately satisfy educational needs without any knowledge and understanding of the problems and their causes?

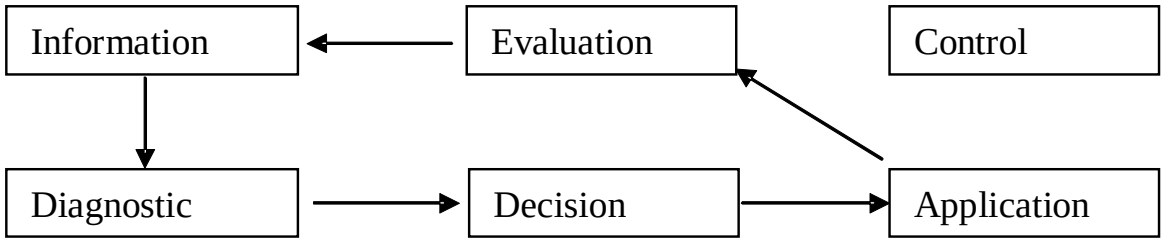
Therefore, other than the collection of information, its storage, and processing, one other major function of EMIS is to facilitate the detailed analysis and synthesis of data in order to draw the most salient and relevant information to help in educational planning and policy decision-making.

EMIS and the school mapping

Generally within the framework of education planning, the information generated by EMIS is particularly useful for the establishment of the **school map,** which in turn will help in the collection and the production of information.

Although school mapping could be one of the biggest consumers of data, these two operations/missions are complementary and should not be mistaken for one another, which is often the case. The existence of an IS which functions correctly is a precondition to the school mapping. The IS produces data which goes beyond the needs of the school mapping to meet those of management, research and planning.

Diagram 1. Role of school mapping in the decision-making process and in educational planning



School mapping is a method that enables the best way of setting up schools and hence the organization of educational offer in a manner that satisfies the needs defined in the plan[7]. School mapping plays an essential role not only in the execution of a policy or an education plan, but also in its preparation. In fact, forming part of the decision and planning process, the school map integrates the spatial dimension of education systems and provides the analytical tools making it possible to identify and project in time and space the physical elements which contribute to a general educational planning effort.

In this capacity, the school map constitutes an indispensable instrument in the hands of education policy managers wishing to review the distribution of existing education services. It contributes to establishing a policy for reducing the geographic disparities identified. More specifically, the information produced by the IS will contribute, via the school mapping exercise in identifying important challenges. Hence, a diagnosis of the education system can be established which will measure the imbalances between the levels of development in enrolments, the running conditions of the schools, and the relation between supply and demand in education.

With its multidimensional capacity, school mapping aims to facilitate the fulfilment of the education plan's objectives, by giving concrete expression notably to their geographic location in order to take into account the distinctive characteristics and needs of each region[8]. In summary, the school map introduces the spatial rationalization in education planning by studying concrete conditions in attaining the objectives of the plan on the regional and local level

[7] Jacques Hallak, *Setting up education policies: role and methodology of the school map.* 1976, pp. 16-17.

[8] OpCit, Hallak, p.23

and in bringing to the fore the preliminary conditions for the introduction of school reforms.

2.3 Monitoring and evaluation of the education system

Rational decision-making, so important in the management and planning of education, also plays a part within the context of monitoring and evaluation of education policies. Throughout the duration of the plan, it requires the availability of reliable and objective information on the way the policies and programmes are being implemented to detect possible pitfalls and obstacles, and consequently to rectify and reorient strategies. How can one attain the set objectives of an education system? Where are we in relation to these objectives? What are the successes and the shortcomings? These are some of the questions to which the information system allows appropriate and objective responses.

By objective data, one doesn't mean the raw data drawn directly from questionnaires and presented in heavy yearbooks without any attempted analysis, but instead, the synthesized information transformed into indicators which make it possible to steer the objectives to be attained, and therefore to manage the education system. A decision-maker needs a more analytical, relevant, synthesized and easy to interpret document, rather than a simple statistical yearbook. Concerned with the effects of his/her orientations and actions, the decision-maker also needs to have recent data on the current school year or at best the preceding one.

In most countries, this constraint is far from being respected due to the slow functioning of the information system, which reflects insufficient human, material and technological capacities. Thus, one observes delays that are sometimes very long between the date of the collection of information and the time of its publication. And yet, to be operational, information should be timely and also sufficiently precise and reliable to measure the effect of a recent policy. The question of the timeliness of information is an essential element in the efficient monitoring of the objectives of education policies; it is the necessary key to the strengthening of education management information systems. Indeed it is obvious that the amount of support decision-makers could give the services in charge of information systems would proportionately increase their capacity to produce valid and directly useful information[9].

[9] Claude Sauvageot, *Indicators for educational planning: a practical guide*. Paris, UNESCO/IIEP, 1996, p.13.

The objectives set in 1990 during the Jomtien Conference aimed to universalize primary education and reduce by half the illiteracy rate of adults from 15 years and above by 2000. Have they been attained? The information produced by EMIS should make it possible to judge. An efficient information system is indispensable in evaluating the progress and impact of these policies. In fact, as mentioned above, the information system should have a global vision of the education system and integrate, in this manner and in a coherent way, the data coming from different sources, pertaining as much to formal and non-formal education as to social, economic, demographic, and even political contexts.

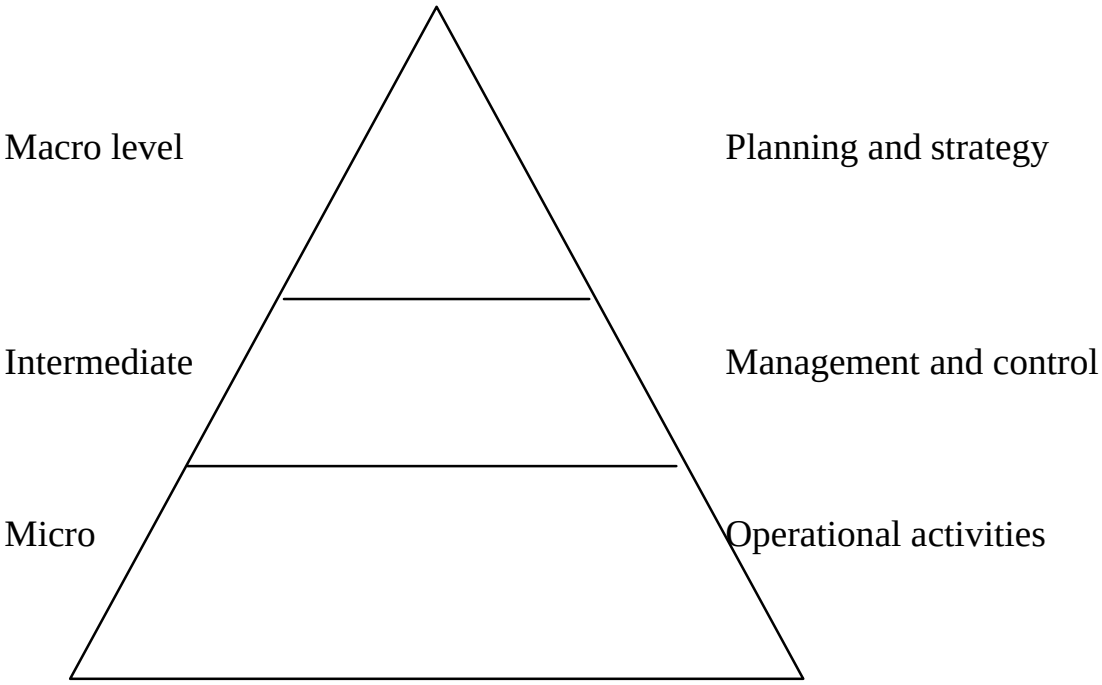
But having data presented in the form of time series is not enough: analytical reports are indispensable. These historic analyses provide the basis for evaluating the actual situation and make it possible to identify disparities, and to study the shortcomings and weaknesses, the bottlenecks and problems in order to determine the necessary strategies in the attempt to solve them. These reports can and should also incorporate the forecasts and projections on the capacities and future needs for teachers, educational equipment, financial resources, and education and training materials. The projections produced through the simulation models are also considered a tool for the management of implemented policies. Used in an appropriate manner, they serve as a warning system to indicate that objectives are not being achieved.

Often, at the moment of policy evaluation, indispensable, timely and complete data are not available. Other specific research is then carried out to tackle the insufficiencies of the EMIS. These limited operations are definitely a duplication of work intended to be carried out by EMIS and consequently constitute a waste of resources and energy, harmful to the efficiency of the management and planning of the system. A culture of evaluation is absolutely indispensable; and should necessarily govern the establishment and the strengthening of education management information systems in countries.

2.4 Providing relevant information in accessible form to all levels of reflection and decision-making of the education system

The preceding paragraphs have highlighted another essential function of EMIS, that of the use and presentation of information. To be efficient, it should be adapted to every decision-making level.

Diagram 2: Use of information by level of decision-making[10]



One generally distinguishes three levels of data use, which correspond to the tasks and particular activities of the education system. The higher the level of detail and quantity of information there is to use, the lower the level of decision-making, i.e., close to the school unit. The quantity of data required decreases as the level of decision-making goes up, the information becoming more aggregated and synthesized, integrating all available data.

The people belonging to the *macro level* are responsible for strategic decisions concerning the planning of the whole of the education system. The category of decisions at this level concerns the general policy and attainable medium or long-term objectives. The information required will deal more with aggregates used for setting the objectives on the national, regional or provincial level. It is at all times essential to have the distribution done according to some categories (age, gender, urban/rural…) in order to target actions better.

The *intermediate level* comprises decision-makers who are in charge of management and control of the allocation of resources, for an efficient and equitable distribution. This level translates the general objectives into more

[10] Diagram adapted from, *Educational Management Information System (EMIS).* Bangkok, UNESCO-PROAP, 1992, p.32.

technical, operational decisions. It therefore requires more specific data to detect eventual malfunctions and to optimize the use of resources.

The *micro level* corresponds to operational tasks, and to more daily activities, closer to the school. The decision here has local and immediate reach and hence will require more detailed information.

Thus, these three decision-making levels, which sometimes overlap each other at the administrative levels (Table 1), require distinct information. They are however linked because decisions at the macro level would be relevant and efficient inasmuch as they are based on precise and reliable information gathered from the lower levels. The information system should necessarily integrate these complex relations between the different levels of decision-making to fulfil its role efficiently.

In summary, EMIS is aimed to strengthen capacities in management, planning and dissemination of information at all levels of the education system for all areas of reflection and decision-making. To attain this goal, it has to:

a) Improve capacities in collecting, processing, storing, analyzing, and disseminating data in order that decision-makers, administrators and managers could base their judgement on timely and reliable data;
b) Centralize and coordinate the dispersed efforts in acquiring, processing, analyzing and disseminating education management information;
c) Rationalize the nature and flow of information necessary for decision-making by reducing and eliminating duplications, and by filling in the information gaps;
d) Link and assemble different existing information systems;
e) Integrate and synthesize in one single system the quantitative and qualitative data; and
f) Improve data collection, and the use and dissemination of information for education management, in order to respond to the constantly evolving needs for information.

3. EMIS: process, human and material resources

To set up EMIS, an understanding of several of its functional components is indispensable:

- Component of data collection
- Component of data processing and analysis
- Component of construction of indicators and tools to help decision-making;
- Component of dissemination and distribution of information produced by EMIS to different concerned structures and to the general public. The dissemination is itself composed of several subcomponents: the dissemination of hard copy (paper) documents (editing, publishing, printing); the dissemination of electronic documents (setting up and updating Internet websites, CD-Rom, on-line documents….)

It is important that all these functions/components be maintained because if one of them is missing or faulty, it is the entire EMIS that will suffer.

It is generally the central administration that ensures the management of the whole EMIS but different modes of organization are possible.

Communication is not always very good between different services of the same ministry, nor between services of different ministries. It is, however, vital for EMIS to maintain smooth communication between all these institutions.

In many countries, the central level often suffers from inappropriate organizational structures and lack of managerial capacities to control the operation of the whole of the education system. The existing communication network does not always allow it to manage at the local level which itself does not or rarely provides timely information to the higher level. There are therefore many difficulties, and, to guarantee that different levels of administration will receive quality and operational information, is difficult. Vertical information is, however, not the only issue in question. Improvement of horizontal information,

meaning information on the same level, between schools, directors, teachers and parents, should also be taken into account.

Last but not least, the means available to EMIS: the existence of human and material resources, in sufficient numbers and quality, are essential to the good functioning of EMIS. This requisite will be repeated as often as is necessary.

3.1 The administrative organization

The organizational structure can vary according to the organization of ministerial services, and corresponding responsibilities and available human and material resources at each administrative level. What is important is to maximize the use of available resources in the national context as it is or as it can be expected to evolve.

For each geographical level, it is fundamental to have human and material resources which are indispensable to the proper functioning of an EMIS.

3.1.1 At the level of educational establishments

The largest part of basic information which is to be fed into EMIS is gathered at the level of educational establishments.

Whether it be in a school, college, high-school, or a higher-learning establishment, it is indispensable to have competent people trained to assume their tasks in EMIS. Their number will depend on the size of the establishment, and the complexity and dimension of the tasks to be accomplished.

The training of these personnel is a fundamental element in the quality of EMIS. In fact, it is the quality of information produced by the establishment that forms the first link of the chain, and largely determines the quality of EMIS.

Efforts should also be made to facilitate the task by providing them with the appropriate tools (e.g. manual, computer equipment, etc) designed according to the complexity of the work.

Facilitating the work also means not submerging them with information requests. It is therefore necessary that both regional and national services coordinate between themselves to harmonize their requests and not add to often identical demands.

3.1.2 At the district level for primary schools, and at regional level for secondary schools

The school district indicates the first administrative level above the school which supervises primary schools. It is the first level of data collection on primary schools but also of the verification and use of these data. For secondary schools, it is generally the region which represents the first administrative level. But administrative organizations can differ from one country to another. What is essential is the notion of the first administrative level.

The first verification of transmitted data should take place at this level. It is indispensable because all the errors detected afterwards will be difficult to correct because access to them would be difficult and very time consuming. In fact, if the central administration finds errors in a "school" questionnaire, it will be obliged to wait for the corrections to be carried out by the school itself, and that would prolong the deadline for the information disastrously. Moreover, it is the structure nearest the school which knows the school best and the one most able to identify errors and ask for corrections from the school establishment the soonest.

3.1.3 At the regional level

For schools as well as for other establishments, the regional level is an important link for EMIS and in particular in the framework of an organization already decentralized or in the process of being decentralized/deconcentrated.

Whatever the level of decentralization, this intermediate level has the function of verifying information before their transmission to the central administration.

But apart from this verification work, it ensures other functions such as data analysis and dissemination of information to all the regional services according to their needs.

The decentralization/deconcentration clearly reinforces the importance of this level and in particular its analytical and dissemination functions.

Here again, the training and the qualification of personnel in charge of EMIS have to be on the same scale as the tasks to be accomplished.

3.1.4 At the central administration level

This is the highest level. It is at this level that the primary mission of an EMIS is developed and includes organizing and coordinating the different services that will participate in EMIS on the national as well as the regional or local level.

Its second mission is to design appropriate tools for the information system: questionnaires, surveys, nomenclatures but also processing tools (cf. chapter 4).

Then it has the mission to process the data and from it draw analyses and studies to synthesize the information in order to make it useful to the different actors of the education system. This is notably all the work of constructing indicators (cf. chapter 5).

Lastly, it has the mission of making the information available and disseminating it. It is a very important function because, for many people, it is the visible part of EMIS. It must therefore be given special attention (cf. paragraphs 4.5.7. and 5.8). As for all the other levels, the training and qualification of the personnel are an essential part of the good functioning of EMIS.

3.2 EMIS: its management and organization in the central administration

Choosing the right institution to manage EMIS is a determining factor. The responsibility for the education information system can come under the authority of several types of institutional organizations:

- Responsibility of the ministry or ministries in charge of education through a Service (a Directorate for example) devoted to statistics, research, planning;
- Responsibility of the national institute of statistics with a service specialized in education statistics;
- Responsibility shared by these two services.

The first situation is the most frequent and seems more appropriate. In this case, the service in charge of the information system gathers and assembles the information and coordinates its work with the corresponding service in the other ministries which provide education (agriculture, health, defense, …) or training (ministry of vocational training, employment…) in order to give a complete range of education and training in the country. Indeed, as mentioned before, some data always depends on other ministries and should necessarily be the fruit of collaboration between institutions.

Even within the institution responsible for EMIS, the organizational structure could take different forms.

The most common is an Office in charge of all the EMIS components (data collection, their processing and their dissemination) for all the levels of education. Sometimes, however, several ministries are in charge of education: basic education, vocational, higher education….In this context, it is an Office in each ministry that manages the different tasks of EMIS. The best solution in this case is to keep a common EMIS service for all the ministries in charge of education. However, if several institutions share the management of EMIS, they have to work in close collaboration in order to coordinate their work, making it possible for example, to know the transition from one system to another. Thus, if there is a ministry of higher education distinct from that of secondary education, it is important to establish a collaboration between the services to analyze the transition 'from secondary education to higher education' in order to have coherent and common EMIS indicators.

In short, there is no unique or ideal model concerning the organization or the management of EMIS at the central administration level, but the coordination and the collaboration between all the services responsible for EMIS are absolutely indispensable.

In the same manner, there is no unique administrative organization for EMIS. Data collection can be organized institutionally in different ways. It is not, at all, indispensable for all the data to be collected directly by one or several Offices in charge of EMIS but it could become the fruit of collaboration between all the services and institutions. Hence, information on personnel could very well be collected from the Office in charge of personnel. The important thing is to organize the circulation of information between the Office of personnel and the Office in charge of EMIS (cf. chapter 4).

3.3 Human resources

For each level and for each task, it is fundamental to have qualified and trained staff to rely on.

Senior education managers should be convinced of the qualification requirement for all the people working for EMIS at all levels. For example, at the regional level, statisticians capable of verifying and consolidating information coming from the education establishments, and of analyzing and

disseminating them, are indispensable. At the central administration, a team with solid experience is required for designing information systems, organizing, analyzing results and making them available to managers of the whole ministry and to the general public. This team should be composed of qualified people with multidisciplinary and complementary skills that include: statistics, computers, sociology, organization and systems management, as well as a good knowledge of school management.

It is very difficult to have qualified and trained personnel for work which requires EMIS at all levels and particularly at the level of educational establishments. That is why training seminars for personnel should be organized in parallel with the setting up and the development of EMIS. For example, it is necessary to train the education establishments in the maintenance and regular updating of school files, school records and class records.

Training should be periodically renewed to update the training and the qualification of particularly mobile administrative personnel. Staff mobility is frequent and is a constraint that should be imperatively taken into account in the setting up of EMIS.

The central administration should manage the staff better by ensuring that 'memory and expertise' are not lost. Here also, because of the lack of attention to this type of risk, many information systems have disappeared. To reconstruct them requires an investment (human, material and time) that is far greater than having to ensure their continuity. It is an element that should seriously be taken into consideration.

Of course, the training can remedy in part the lack of qualification of the personnel, but it cannot by itself fill very important qualification gaps. Some countries organize the mobility of qualified personnel between different ministries such as statisticians or computer specialists. This could temporarily resolve the qualification gap within the ministry of education.

3.4 Material resources

The need for material resources is as important as the need for human resources, at all levels. Of course, there is no reason to wait for computerization and telematics to reach the school level before starting EMIS. It is necessary to make EMIS evolve as information and communication infrastructures and develop and reach the regional, district, and school levels (especially secondary level establishments). It should be noted that few countries, including the more

advanced ones, have computer equipment for administrative use in primary education establishments. The reasons are simple:

- apart from the school director, there is no administrative unit or support staff in schools. It is generally through a paper "questionnaire" that data collection is carried out in schools.
- the number of schools is significant and consequently, the cost of equipment is considerable. If there are more possibilities for financing computer education, there are less for financing computerized administration services whether it be at the State or regional level.

By contrast, many countries have equipped their secondary level establishments with computer systems for the administration. This is an element that opens a lot of perspectives.

Other than equipment, it is necessary to provide computer programmes, which will enable more efficient use of the computers. It is the work of the informatics services which are directly responsible for the distribution of computer programmes. It is also the central administration that designs (directly or by sub-contracting) the programmes and computer applications for regional services. It also elaborates the tools for the districts and schools (questionnaires, data collection….). It is however desirable to link with the regions, the districts and the education establishments in order to guarantee the coherence of tools and procedures used at all levels of EMIS. This coherence is fundamental to the proper functioning of EMIS.

Another important element is to link the management tasks and the information necessary for EMIS. It is in fact a good way of ensuring the quality of information contained in EMIS because the data used for management purpose are, by necessity, often more updated or better verified than the data produced only for use external to management, as can sometimes be the case for EMIS. Computerization can facilitate narrowing down this gap. (cf. chapter 4).

The tools (statistics, computer, telematics) should also evolve according to the improvements brought about in the information system.

For example, if Microsoft Access is often sufficient at the beginning, it is sometimes necessary in the second phase to evolve towards more powerful database management systems allowing remote access by different categories of users and open on the Web.

It goes without saying that the qualification and the training of personnel should match the level of the equipment used. Ignoring this obvious fact leads to a considerable waste of time and money.

3.5 Centralism, deconcentration, decentralization: what is the correlation with the organization of an information system?

The administrative organization of ministries in charge of education and training are extremely diverse. Some are very centralized and wish to remain so, others are centralized but have the will to deconcentrate and/or decentralize, and others still that are already largely deconcentrated or decentralized.

The information system should adapt to this type of organization, but it must keep its objectives of coherence, of unity and transparency regardless of the administrative structure.

Therefore, whatever the organization, the basic documents of the information system, the nomenclatures, the instructions for filling in the documents must be elaborated by the unit responsible for EMIS at the central administration.

The other functions can subsequently be organized according to the conditions of the country. Thus the circulation of documents and their computer processing could be very different from one organization to another. A strongly decentralized country will need significant processing, research, information dissemination at the regional level; but a centralized country will ask for data entry at the regional level and then make relevant information available to regional actors. The important thing is to respect the objectives indicated above: coherence, unity and transparency.

Informatics and telematics structures should also adapt to the administrative organization.

It should nevertheless be pointed out that the recent progress made in management of information networks and in database management have brought them a flexibility which they did not have years earlier. It is, for example, possible to use a centralized computer in a decentralized organization. In fact, to reduce maintenance costs of the EMIS database, one could very well group together all regional databases. The condition is to have a very efficient telematics network and a good management of access rights to different bases. It is important to note that computerization and telematics aspects are now less

burdensome on the administrative organization and on the information system than they were in the past. Provided, of course, that the computerization and telematics system have been well designed and set up…. Maximum attention should therefore be given to these elements (conception, setting up).

4. Data collection

Data collection must include all the fields covered in EMIS. In addition to education data, it should gather and assemble other information indispensable to EMIS: in particular the demographic and financial data which are necessary for the calculation of enrolment rates, and financial indicators (for example, education expenditures in relation to GDP); and also qualitative and contextual data necessary for the analysis, comprehension, and the interpretation of trends in education .

Data collection is one of the main objectives of the education management information system (EMIS). It is the system's backbone as the latter is supplied with all the relevant information. Consequently, the way in which the data are collected (data collection process) and the quality of this collection are of major importance in the reliability of the whole system. Indeed, the improvement of countries' capacities in matters of education planning, management and administration, must be conducted firstly through an improvement in data collection (as well as statistical analysis as mentioned above) concerning the activities of the sector.

The capacity of countries in matters of data collection is extremely variable. If some have already relatively well-developed statistical systems, others have hardly started collecting education statistics in a systematic way. The majority of countries are in a situation between these two extremes: they systematically collect information from education establishments but have serious problems with regard to quality, detail, analysis, and timely publication of the data collected[11]. In general, data collection is a costly exercise, not easy to organize in many countries because of (among other reasons), isolation and distance of schools. Finally, the nature of information to collect and their relevance vary according to the needs of each country. This poses the problem of striking the right balance between information needs and the cost of their collection, in particular in countries that do not have enough resources.

[11] Report on the collection and use of data in developing countries, UNESCO, 1983.

4.1 Principles of collecting education statistics

Inspiration can be drawn from a certain number of general principles that characterize data collection, to help determine the type of information to gather and assemble, and the way to proceed. The quality, reliability, and indeed the usefulness of data collected depend on the attention given to these principles, which are not mutually incompatible but can be competitive,[12].

- The data collected should be based on clear definitions devoid of all ambiguities. To this end, it is necessary to rely on common notions, even if the data are used strictly for national purposes. Managers of data collection should be aware of the problem of compatibility and should use standard statistical terminology for the purpose of international comparisons in the field of education[13].

- The data should be complete in the sense that they should be based on a complete list of the public and private education establishments within or outside the authority of the national education ministry and approved or not by the latter. This principle assumes, on the one hand, that all schools fill in and return the questionnaire that is sent to them, and on the other, that all the elements, such as the statistics on student flows which is indispensable to the management and planning of education activities, are filled in.

- The data should be exact. For this purpose, it is indispensable to have a screening task to detect and correct errors at every level of collection and compilation of statistics.

- The data should be sufficiently detailed. If the aggregation of data is necessary, it should be carried out without a significant loss in

[12] OpCit, UNESCO 1983 p.6.

[13] UNESCO has developed to this end the International Standard Classification of Education (ISCED) in 1976, a tool to help countries in harmonizing their education data for the purpose of international comparison. The ISCED has been revised in collaboration with the OECD and EUROSTAT in 1997 and no longer includes 7 but 6 levels.

information. In fact, overall data could harm certain types of studies and it is always useful to be able to trace the details of information.

- The data should be timely. Lack of updated statistics is a real problem for education planners and decision-makers. There are often too long time-gaps between data collection and the date of their publication, resulting in reduced utility of the data for the purpose of managing, planning and monitoring education. The delays in the publication of information is often due to the slowness of data collection, verification and correction. To speed up the process, one can intervene at the school level in order for schools to quickly respond to the questionnaires and provide competent services with increased qualified personnel and material resources at the regional and local level, capable of verifying, rectifying, and processing the data.

- The data should be relevant from the perspective of the users. This assumes a preliminary analysis of information needs which can vary, for example, according to the level of administration and of decision-making (see table 1), and consequently a close collaboration between the education statisticians, planners, administrators and other user groups[14].

- The data should be accessible, meaning published in a form which renders them largely comprehensible and not only in heavy yearbooks, as it often happens, with little research and analysis. They could also be made available on electronic media accessible to many users, who can themselves, up to a certain point, construct their own information queries.

[14] OpCit, UNESCO, 1983, p.6.

Table 1. Information needs according to administrative level[15]

Level – Actor	***Information needs***
Class - teacher: • To develop pedagogical strategies and materials, tests; • To identify the learning difficulties and successes of pupils and the pedagogical responses; • To control the assiduity and discipline of pupils.	• National objectives and criteria; • Detailed results by subject, by pupil; • Records of attendance updated, communication with the director and parents.
School - director: • To formulate the objectives and strategies of the education establishment; • To monitor the admission and registration of students; • To control results and the assiduity of pupils; • For the support and supervision of teachers, etc.	• National objectives and comparative data of other education establishments; • Updated files on students, personnel, buildings and equipments; • Class results compared to previous years and other similar schools; • Attitudes, motivation, recruitment and needs for teacher training.
District/region - manager at local level (less detailed data than for the daily tasks at the school level): • For the monitoring of admission and registration of pupils in the schools of the region/district; • For short-term projections of personnel needed in the region/district; • For identifying needs for resources in schools, etc.	• Pupils' admissions, registration by school (by gender and over several years); • Demographic data by age group, previous rates of admission flows; • Actual resources, requests for equipment, materials, school furniture, needs for teachers and overtime hours.
National - Planning Directorate (even more aggregated data focused on essentially quantitative aspects of education development): • For the preparation of monitoring and evaluation of the plan; • To establish a diagnostic on the access to different levels of the education system; • To evaluate internal efficiency, the regional disparities; • To estimate the needs for teachers; • To prepare the national budget for education.	• School-age population, admissions, schooling, transition (by gender, region, etc.); • Promotion, repetition, drop-out; • Projection of personnel, teacher supply • Budget, request of resources from regional offices and evaluation of the available resources.

[15] OpCit, UNESCO, 1983, p.12.

4.2 Methods for the collection of statistics in education

Statistical information related to education can be collected in different ways. One can basically list four ways, which are not mutually incompatible. They can be used in a well-organized data collection programme:

a) Annual census of all the education and administrative establishments. The latter occupies a central place in EMIS because it constitutes its principle source of information.

b) Systematic transmission of gathered and assembled data for administrative needs .

c) Periodic or selective surveys based on a representative sample of schools and aimed to collect information on particular questions.

d) General population census or household surveys on questions other than those pertaining to education.

The first three methods including the population census form part of what can be called administrative sources, while household surveys form part of "other" sources. Although the population census and 'household' surveys contribute important information to EMIS they are not in themselves part of EMIS.

The different methods of collection mentioned are not all adapted to the types of information that one wishes to obtain[16]. Thus, sample surveys, more than being a rapid way to make comprehensive information available, highlighting the major trends in enrolments, are very useful for collecting data necessary for some particular research studies concerning, for example, factors such as the causes of drop-outs and repetition, those preventing pupils from attending school regularly, the socio-economic origin of pupils, the professional expectations of school leavers, etc. By contrast, the global data on enrolments by gender, age and study year, on the number of teachers by level of education and qualification, etc., as well as on financing by level of education, type of programme or nature of expenditures, on other categories of personnel

[16] OpCit, UNESCO, 1983, p.12.

and on the infrastructure, must be collected in a regular manner by the census on all the education establishments.

If a specific method of collection often matches a given type of information, it is also true that this categorization is sometimes rigid. One finds countries where the questionnaire of the annual census integrates qualitative concerns which are generally covered by surveys. In Zambia, the questionnaire is so detailed that it includes, for example in the case of dropouts, the causes of this phenomenon (table 2).

Table 2: Number of dropouts by grade and by cause at primary school level

Causes	Gr 1		Gr2		Gr3		Gr4		Gr5		Gr6		Gr7	
of drop-outs	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Illness														
Death														
Pregnancy														
Economic														
Dismissal														
Desertion														
Others (specify)														
Total														

Source: Zambia, Annual school census questionnaire

It is important to note that, whatever the method used, two modes of processing and collection are possible:

- The first is based on the global data concerning different elements (pupils, teachers, different types of education facilities, financing, etc.) provided in general by the education establishment which is the basic unit of information;

- The second depends on individual data informing on the characteristics of diverse elements. Instead of providing global data (total numbers), each education establishment communicates the information on each element of the whole. This assumes that each person considered would have a code number and that all the information concerning her/him would be registered under this number. The data can be drawn from answers to questionnaires filled in by the person herself/himself (for example the teacher or the pupil)

or by the responsible authority (ex. the chief of the school establishment). This mode of collection is generally known under the name of individualized data system. It has the advantage of eliminating risks of double counting of pupils and teachers. The individualized data system makes it possible to track the pupils and is particularly appropriate for data collection relative to flows. However, the application of such a system has a cost. It assumes the existence of management tools (preferably computerized ones) and skills in using them, at the school level. Consequently, despite its advantages and precisely because of its cost, the application of such a system remains essentially limited to developed countries and more generally to secondary and higher education levels.

The information stemming from these four principal methods of education data collection can be complementary, but not always comparable because they are based on different methodologies. Their comparison is however useful because they can reveal their mutual weaknesses. Thus the comparisons between the annual census of pupils and the general population census make it possible to control the quality of each of these two sources by an in-depth comparison of their results and by trying to understand the eventual reasons of divergence. The harmonious integration of these sources of information in EMIS undoubtedly constitutes a wealth for the latter, not only because education opens to other sectors in this way, but also because it makes it possible to improve its capacities in data collection.

4.2.1 Periodic annual census of education and administrative establishments

Periodic census of education and administrative establishments is by far the most important of the four data collection methods on education. It constitutes the central element of the education statistics collection in almost all countries[17]. The method consists of sending a questionnaire to education establishments to obtain information on students and different personnel, on school-buildings and other facilities, on teaching materials and on financing if the need arises.

[17] OpCit, UNESCO, 1983, p.13.

The conception of the data collection instrument and its presentation differ according to countries. For example, in Zimbabwe, the questionnaire is composed of separate sections. Some are used for compiling statistics while others, such as those on teachers, their qualifications and their pedagogical experiences, etc., have objectives other than the compilation of statistics because they are used for managing personnel.

The questionnaires can also differ from one country to another with regard to its length including presentation of instructions, explanatory notes and definitions intended for the people in charge of filling them in. Despite these differences, a fundamental principle should characterize a good questionnaire: it should be clear, simple, without ambiguity in the questions asked in order to collect the answers of the same quality. Moreover, it is indispensable to keep in the questionnaire only the questions that are absolutely indispensable and whose answers cannot be obtained by other sources of information.

Periodicity and tools for school census

The school census date is very important because the number of pupils and teachers can vary during the course of the school year. Data collection is generally done on an annual basis and takes place at the beginning of the school year in the majority of countries, that is to say around a month after the school year begins. Counting children at the start of the school year is particularly important in countries where compulsory education is not rigorously applied and where school dropouts are under observation for different reasons for a brief period. This enables taking all the children into account for the calculation of enrolment flows.

However, in many countries, pupils who do not attend classes or drop out in the middle of the school year, often continue to appear on the records. This results in overestimating the real numbers and can provoke significant distortions when one estimates promotion, repetition, and dropout rates. To solve these different problems, some countries, notably in Latin America, but also in Africa, carry out two, even several censuses during the school year. Again in Zimbabwe, the reason behind the organization of two school censuses per year is due to the fact that it facilitates the allocation of teaching and training materials as well as the disbursement of grants per head which takes place by trimester and is based on the number of pupils in each school. Since the number of students and personnel stabilize in the middle of the second trimester, it is considered useful to carry out a second exercise of data collection. It is important to emphasize that this approach, legitimate as it is,

can prove to be costly, requiring the necessity to explore or use other methods of collection, such as surveys, to measure, for example, the number of drop-outs during the year.

When a school map exists and works appropriately, it allows the updating of the data (once recorded at the time of the school opening) at the end of the year.

School files

The filling-in of questionnaires takes place on the basis of information provided by school files kept by all education establishments. These files are administrative and management tools of "education" activities and thus constitute a precious source for filling in the questionnaires. The coverage and quality of data collected will depend on good record-keeping.

School files are essentially composed of class records and school records. These records, in principle, provide a permanent status of students enrolled in the school, indicating their progress from one year to the next over the school cycle.

School records are the principal source of data on enrolments corresponding to those registered at school. Normally, these records contain information on the current school year, the name, the age, and gender of the pupils, the status of the pupil (repeater or not, coming from another school or not). They should also take account of the career of each student in the school system. The type of information found in them varies considerably from one country to another according to the local conditions and the general degree of development of the national system for data collection[18].

Thus, the record-keeping system applied in Malaysia entails two cards per student which match individual records: the school card and the confidential card. The first contains detailed information on the student and his/her family, and the second contains the observations or personal assessment by the teachers. The information found on these two cards is very detailed. The school card informs on the student's profile, her/his situation in the family, school attendance, extra-curricular activities, public examination results, grants and allowances received. The second more confidential card contains

[18] OpCit, UNESCO, 1983, p.64.

detailed information concerning the student: health, personal quality (self-confidence, sense of cooperation, sense of responsibility, initiative, sociability, presentation…), special interests, preferences, results of interviews between the head of the school establishment or teachers and the student and his/her parents. These two cards follow the child in the course of his/her school career. In case of a change of school, the new establishment is obliged to ask for the records from the old school. The cards are kept by the last school attended until the end of secondary studies.

The class records are, in particular for primary education, the principal source of information on the attendance and daily attendance. It also gives complementary information on the school career and personal information on students (admission date in the class, name of parents or guardian,…).

The two records, class and school records, are complementary and some information relative to personal characteristics of students necessarily appear in the two. Other than these two types of records, in some countries, the education establishments keep a special admission record, which contains more specific information on the admission of pupils

4.2.2 Collected and assembled data for administrative needs

Initially, an education system produces information for its own administration and management purposes. The administrative records therefore constitute an essential source of information on elements as important as education financing and expenditures, salaries and qualifications of teachers, study grants, examination results, etc.

Because education implies cost, its management therefore requires sufficiently detailed financial statistics to establish the budget and accounting. Moreover, if one wishes to control the quality, the efficiency, even effectiveness, as well as the outputs of the education system, it is necessary to have information on examination results. And since the ministry of education is the biggest employer in the majority of countries, it therefore needs to take into account the detailed files on personnel for administrative purposes (payment and recruitment control, fixed salary scale, promotions, policies on academic qualification requirements, etc.) [19].

[19] OpCit, UNESCO, 1983, p.14.

In a situation where the majority of statistics necessary for the planning, monitoring and research are contained in files and records often designed strictly for administrative purposes, the task of education statisticians and planners is not to monopolize this information, but to design and store it in such a way that would render them equally useful for purposes other than the purely administrative[20].

4.2.3 Periodic or selective surveys by sampling

Unlike in other fields such as demography, health, employment, and agriculture, where they are largely conducted, surveys by sampling have hardly ever been used in education sectors, at least in developing countries. This method, however, has significant advantages, one of which pertains to its cost, which is relatively lower compared to exhaustive school censuses. Above all, it speeds up the availability of data: untimely data has been one of the weaknesses of information systems in a number of countries, hindering information from being used in planning and decision-making.

Well-designed and well-conducted surveys by sampling based on representative samples of schools, enable the collection of only a limited number of information. But because they show overall evolution, they can provide useful information for the definition of policies, and information almost as precise as those obtained through an exhaustive survey. In this sense, a research through sampling is often more useful than a complete survey to define policies.

Surveys by sampling have a certain number of advantages. They can for example be used for the following purposes:

- To verify the accuracy of collected data through annual school census;
- To collect statistics on elements where information is needed for selective research studies and for the formulation of policies in particular fields;
- To collect qualitative information on, for example, the causes of such or such phenomenon;

[20] OpCit, UNESCO, 1983, p.14.

- To collect statistics on elements not requiring data collection every year and therefore not appearing in the annual questionnaire sent to educational establishments;
- To collect detailed information which, because of its nature, requires the hiring of qualified surveyors instead of using questionnaires sent through mail or filled in by people not trained in qualitative and specific survey methods;
- Surveys by sampling in the field of education are therefore a means of completing information collected through annual census. However, to be able to take advantage of survey by sampling, countries should have reliable sampling bases (representative sample of all the education establishments), and should train statisticians and surveyors in this technique and method. In addition, research is necessary to determine the best way of collecting diverse categories of statistics related to education[21].

4.2.4 Other sources of education data

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The administrative source resulting from the three data collection methods described above and forming an integral part of EMIS, provides information dealing generally and essentially with current activities within the education system. They rarely provide information on what goes on outside the said system, which, however, is necessary to the understanding of its running and evolution.

The general population census and the household surveys based on representative samples of the whole population are not direct sources of education information because they are designed for other purposes. They nevertheless allow the collection of information on some questions related to education. Thus, the information concerning the general level of the population in its totality are obtained due to these sources. The questions related to education which appear in the population census generally deal with literacy, education level, and school attendance which are not always correctly filled in by the administrative source because of poor class/student record-keeping. These last two types of information are also collected through

[21] OpCit, UNESCO, 1983, p.15.

household surveys, which are, in general, for the purposes of employment, health, demography, agriculture, etc.

These indirect methods of collecting education statistics have some advantages in comparison to the principal administrative source, which is that of the school census. In addition to education data on the entire population which they enable to collect, the population census as well as the household surveys provide a group of contextual information, making it possible to analyze and understand some situations and evolutions. For example, in providing information on the characteristics of children not attending schools, or causes of other phenomena such as school dropouts, the household surveys, in particular, are an appreciable source of information in the demand for education which constitutes an important lever for political action in matters of education. This alone justifies the necessity of integrating these sources of information in the EMIS in order to promote the secondary use and analysis of education data resulting from it.

Another advantage of these methods, population census in particular, is that they allow extremely fine analyses of the reality of education, thus highlighting the spatial inequality in the distribution of education, an indispensable information for the definition of all education strategies. Finally, the recourse to household surveys as a source of education information is also more and more recommended, undoubtedly because of their relatively lower cost, but also because they are one of the answers to the absence of reliable estimates on the school-age population (necessary for the calculation of enrolment rates), an absence due notably to very old demographic census in some countries.

Indirect methods of data collection also have disadvantages. Designed for other purposes, they are, nevertheless, a limited source of information on education. The collected information is not always relevant or reliable because they measure some phenomena such as illiteracy on a declarative mode and not on the basis of tests. These surveys are, in addition, very selective and are rarely renewed (the population census generally takes place every ten years) to allow for an efficient monitoring of policies.

The data resulting from them provide information on different education phenomena and are not always strictly comparable to those provided by the school census. Thus, the school attendance rate collected through the population census and the household surveys cannot be directly compared to the enrolment rate obtained from administrative sources. These two rates

describe different things. The first makes it possible to measure the proportion of children who actually go to school, thus the reality of education in a given moment, while the second is an administrative measure and reflects the size of the school enrolment at the beginning of the year. This being the case, the comparison of these rates is instructive. The school attendance rate should in principle be lower or equal to the enrolment rate. However, one observes situations where the first is higher than the second, which can be an indication of problems of coverage and of data collection or of another phenomenon often observed in certain countries where only the children who have duly paid their enrolment are counted as enrolled. Those who have not paid before a certain date are nevertheless permitted to remain at school, without appearing on the records of administrative enrolment.

To conclude, the use of education data coming from indirect sources can highlight the insufficiency of the collection capacity of the administrative source and hence can improve the latter. However, despite their provision of supplementary and in some cases indispensable information, the three other methods of education data collection cannot in any way replace the annual school census which is a much more important source of varied and detailed data on the education system.

In addition to these different sources, one should also use the data gathered, often for management purposes, by other services of the ministry of education. It is an important element, because EMIS should assemble the totality of useful information whatever might be their source and usage. This is why it was deemed useful to include the following table.

Table 3: Principal sources of education data in developing countries

Data Sources	*Characteristics*	*Quality*	*Frequency*	*Comments*
Administrative sources of education data				
1. School census	Principal source of education data in the countries	Covers all the schools in principle. * But in reality the rate of failure to respond can be considerable, in particular from the part of the private sector and non-approved schools. * Other problems: the tendency of education establishments to overstate their school numbers for reasons of financial grants	Once, even several times per year	
2. Administrative data Administrative records	Main source of information on the financing and expenditures of education, on teachers and their characteristics (salaries, qualifications, etc.)	* Often incomplete. * Problems of fictitious or "ghost" staff maintained in the records	On a regular basis	Because the quality of these records could sometimes be incomplete, even obsolete, the data on teachers, for example, and their qualifications are collected several times each year at school level.
3. School files * School and class records	Information source on the permanent status of students enrolled in the school.	Often mediocre because of poor record-keeping	On a regular basis	Although they are administration and management tools, these files constitute a precious source of data. Unfortunately, they are often incomplete and poorly filled in.
* Enrolment records	Contain more specific information on enrolment of pupils	Often mediocre because of poor record-keeping	On a regular basis	Although they are administration and management tools, these files constitute a precious source of data. Unfortunately, they are often incomplete and poorly filled in.
4. Examination results	Generally used at the national and regional level	High, when certain principles are followed.	Annual	
National learning achievements tests	Surveys on the achievement levels in key	Relevant to the national curriculum	Can be annual	Can be based on a sample or can cover all the students of a given grade.

Data Sources	*Characteristics*	*Quality*	*Frequency*	*Comments*
	disciplines, and on factors linked to high achievement levels.			
Other education or training organizations or institutions collecting information on education **Indirect sources of education data**				
1. Population census	Provides useful data for the calculation of enrolment ratios, but also statistics on certain aspects of education: literacy and level of education attained.	* Under-estimation can go up to 5 to 10% * Self-declaration of literacy	Every ten years in the majority of countries	The data resulting from the census are an insufficient measure of literacy or illiteracy. Other surveys often based on tests attempt to give a more or less precise idea of the phenomenon.
2. Household surveys	Based on a representative sample of the whole population, these surveys which are designed for other purposes are an appreciable source of information on the enrolment or non-enrolment and on factors linked to the demand for education.	The rate of non-response is generally low, hence low sampling errors. But if these latter are effectively low at the national level, it is not the case at the disaggregated level where they can be higher.	Irregular	In addition to national household surveys, surveys of the same type are more and more organized and financed at the international level and are a source of education data. Among the better known ones are: EDS (USAID), MICS (UNICEF), the surveys to measure standard of living (LSMS, World Bank). A new generation of EDS has been introduced (DHS EdData Survey) which provides more information on education. Uganda is the first country to have carried it out.

4.3 The coordination of different ministerial departments and services and the ministry(ies) in charge of education

It is indispensable to complete the annual school census with the information collected from other services of the ministry or ministries in-charge of education.

For example, interviewing personnel services so they can provide all the information useful to EMIS, is indispensable. It is also necessary to define with these services the information to be collected annually from the education establishments, to enable them to provide information directly from their files. Proceeding this way is extremely important. In fact, to centralize the information and optimize resources, the central services should coordinate among themselves in order to avoid double (triple, quadruple, …) requests for information from the school establishments on the same subject, originating from different services of the central administration. To facilitate this coordination, the central administration as a whole should publish the list of information of a statistical nature, which will be collected in the course of the following year. To elaborate this list, a coordination unit should be set up, which, if it works, will eliminate the duplication of work and will clearly attribute to each of the services the type of information to collect. It is in fact useless to have three or four services which produce and update teaching files with the same data but for different purposes: because over and above the cost, there is always a risk of incoherence and reliability of data. It is better to coordinate among each other and have only one source, devoting to it the resources necessary to make it reliable to the maximum, and disseminate the information to all the users by integrating it, for example, into the more general dissemination of the information contained in EMIS.

National coordination should be completed by the coordination between regional services and the coordination of regional services with central services.

The fields which require the closest collaboration are:

- personnel (teaching, non teaching): information on the stock (age, seniority, gender, qualification and certification, subject), information on flows (intakes from training centres or recruitment of non-certified personnel; but also attrition by type: retirement or resignation); information on in-service training activities;

- education expenditures by type of expenditures and level of training.

4.4 Information requests from non-educational services

These requests mainly concern two fields:

- Population. It is indeed essential to have the most detailed population data (age, gender, region,….) for previous as well as for projected years. This data is generally produced by the national institute of statistics. A close collaboration should be set up with this institute in order that the most recent and reliable data be always available, and additionally, to make it possible to perceive and therefore estimate the migrations, as a result of the pupil census. In fact, the migration phenomenon is very important for the education system which should adapt itself by constructing new schools, appointing teachers or on the contrary, by closing schools and redeploying the teachers.

- Financial data. It is fundamental to relate education expenditures to the main economic and financial indicators concerning the entire country in order to evaluate the resources which can be mobilized: Gross Domestic Product or Gross National Product, national or local budget and expenditures. Here again, it is the national institute of statistics in general which prepares these economic and financial data.

This collaboration must absolutely be set up and maintained, because the quality and the timeliness of this data largely determines the relevance of an EMIS.

To illustrate, diagram no. 3 describes the flows of information used in a country. One can observe the links between the central services, between the central services and the provincial/district services, as well as the importance of sources external to education (population, general data on the planning of the country).

List of essential data to collect at the national level from each education establishment

Data on pupils:

- distribution by grade, gender and age;
- distribution of repeaters by gender and grade;
- for the first grade: distribution of repeaters by gender and age;
- number of pupils attending double shift classes by grade.

Data on teachers and other categories of personnel:

- distribution of teachers by level of qualification and certification, by grade and by gender;
- distribution of teachers by age and by gender;
- number of teachers working double shifts;
- number of teachers in multi-grade classes;
- number of non-teaching personnel by categories, age and gender.

Data on education establishments:

- number of classrooms;
- places available in boarding schools and university campuses, in school canteens and university restaurants;

List of essential data to collect at the national level on education expenditures:

- The education budget in the overall State budget (budget voted and budget disbursed) broken down by level;
- The expenditures at the local level, of private organizations by level;
- Gross Domestic Product and Gross National Product

List of essential data to collect at the national level on population:

- Distribution by age and by gender of the population from 3 to 29 years old by region, each year for at least the past 10 years, with projections for at least the next ten years.

4.5 The data collection process

What is important is to make best use of the available resources and to help the process to evolve by accompanying the evolution of these complementary sources.

Informatics and telematics constitute the essential elements of the data collection process and the capacities of countries in this field should be optimized. While these capacities evolve and, in general, improve, the collection system should follow this evolution and even anticipate it. For example, as soon as the plans and main lines of informatics and telematics development are known, it is necessary to foresee the evolution they will render possible for EMIS.

However, one should not expect everything from informatics and telematics and thus postpone the setting up of EMIS by waiting to have sufficient resources available in this field.

4.5.1 The transmission of questionnaires to schools

The transmission of documents between the central administration and the heads of schools should be as fast as possible. The simplest way is to organize the transmission of "paper" questionnaires through different ways: by post or delivery by hand to the heads of schools, either by special transport or, for example by convocation or a planned trip.

As soon as it is possible, these questionnaires can be provided on electronic support (diskette, CD-Rom,…) by adapting the questionnaires to the possibilities offered by electronic support (in the form of Excel spreadsheets, for example).

Whatever the form of the questionnaires (paper or electronic support), they should be accompanied by precise instructions for completion and by a detailed description on the nomenclatures used.

The transmission should be organized from an updated list of schools. The updating of the list of schools is extremely important because it will guarantee the quality of the census. It should include all the schools forming part of the scope of the surveys: public schools, private schools, community schools….

Without the constant updating of information on schools, the quality of data and their reliability will inevitably be faulty.

4.5.2 The filling in of questionnaires by schools

The instructions accompanying the questionnaires should be precise and understandable. Specific training of personnel on these should be organized to accompany the setting up of the information system and provide the necessary complementary explanations. Relying on the instructions and training, the schools can fill in the questionnaires while respecting the deadline given by the national managers of the information system.

4.5.3 The return of questionnaires back to the administrative levels responsible for schools and to the regional levels

Once the questionnaires are filled in, the information should be transmitted as fast as possible to the inspection office or to the regional service in charge of the school and of data collection. At this level, a necessary preliminary verification of the data transmitted will be carried out.

All errors detected at a later date will be difficult to correct and are time consuming. In fact, if it is the central administration that finds the errors in a 'school' questionnaire, it will almost be impossible to wait for the corrections from the school, thus disastrously extending the deadline for the availability of the information. Moreover, it is the structure closest to the school which is better informed of the latter and therefore in the best place to detect the errors and ask for the quickest correction from the school.

Likewise, decentralization and deconcentration require fast processing at the decentralized and/or deconcentrated levels. This strengthens the requirement that verifications be done at the level close to the school for rapidity.

The filling in of questionnaires by the schools, the verification of the questionnaires by the administrative unit close to the school, should be accompanied, as mentioned above, by training activities for personnel who are in charge of this work. This training is indispensable and should be periodically renewed because personnel change, and information and/or training is not always passed on…..

If the questionnaires are on 'paper', it is possible to organize data entry at the regional level with accompanying human and financial resources thus required. This allows increased efficiency in speed and quality and enables the rapid availability of data at the regional level, which should in principle accompany the operations of deconcentration and decentralization. Of course, as soon as the telephone and computer networks and equipment allow the transmission of electronic support, it is necessary to adapt the questionnaires to these new possibilities in order to enable the filling in and the transmission of the questionnaires through such means. In this case, providing training in the use of electronic tools to the personnel at school, at the level of administrative services responsible for the school, and those based at the regional level is indispensable.

Relying on the updated list of schools, it is imperative that the schools that have not answered within the deadline be contacted again in order to arrange another date with them for the return of the documents. This makes it possible to ensure as complete a survey as possible. This follow-up work is absolutely essential and must start before the deadline for the return of the documents: preparation of the list of schools to follow-up on, and setting up of a fast communication channel with these schools.

4.5.4 Returning questionnaires to the central administration

Once the questionnaires are verified, they should be transmitted as fast as possible to the central administration, if possible by telematic means.

The central services should above all carry out a final verification of the data before integrating them into the central database.

They should first of all verify the coverage of the survey to ensure that all the schools, whatever their type may be (public - private, formal - non formal), have responded to the survey. If this is not the case, another follow-up should be arranged to the concerned regional services and stronger pressure should be applied to obtain the best possible coverage.

As soon as the follow-up is finished and the last questionnaires are received, an appraisal should be carried out. If it appears that there is still some missing data, it is necessary to choose the right solutions. Several of which are possible:

- use of a coefficient corrector on all the data to reconstitute the coverage;

- use of the previous year's data;
- estimation for each of the missing schools.

At any rate, it is indispensable to manage the non-responses and to make note of them in order to remedy this problem the following year. It is also important to specify in the appraisal of the survey, the scope of the responses and the treatment of the non-responses. To guarantee the reliability of a chronological analysis, it is imperative to conduct an appraisal annually.

4.5.5 Data processing and computerization of data at the central administration level

The rapidity of information processing and their availability at the different services will depend on the quality and the rationality of the computerization.

The first phase of the processing consists of a new verification of data and their internal coherence.

The second phase is the constitution of a new database or, if this has already been done, the introduction of new data into the database.

The third phase concerns the first statistical processing of data.

Several modalities are possible for computerization. They depend on the volume of the data to be processed, the human and material resources (computers and computer programmes, statisticians) available in the country.

For the first phase, if a spreadsheet like Excel can do the first data processing, the new data have to be quickly assembled and organized in a database. The first level of database could be mounted into programmes like Microsoft Access which allow an easy organization of data, and require for this purpose a minimum training. For the level of final verification of data, one can also use statistical programmes like SPSS, SAS or IDAMS.

For the second phase, which consists of creating a reference database, programmes like Excel or Access can again be used. However, it will soon prove indispensable to have a real database management system, like Oracle, for that will greatly facilitate the next phases.

Once the data are verified and stored in a database, one can move to the third phase, that of the first statistical processing. Again, Excel and Access can be used, but these programmes, while simple to use, are limited when there is a great volume of data and real statistical processing is needed. It is preferable to use real statistical programmes like SPSS, SAS or IDAMS which will also facilitate routinization - repetition of these processing which are also well-adapted to the processing of databases of the 'Oracle' type.

It is important to quickly carry out the first processing to produce a first analysis and a first dissemination of information. Indeed this is fundamental for the improved status of EMIS which, in this way, can demonstrate its capacities to quickly provide recent information.

All the data processing has to produce the elements necessary to the detailed dissemination of the information but also feed the works on the indicators (cf. chapter 5). Since the publication can take several forms, and use several supports, the processing has to be adapted to them (cf. below). There will necessarily be tables printed on 'paper' or other forms of readable worksheets in programmes like Excel, but also synthesized worksheets to feed the programmes used for a wider dissemination of information.

It has to be kept in mind that for each of these phases, it is necessary to take into account the local situations and the human and material resources available, without forgetting to resort to a specialized training in a systematic way.

4.5.6 Analyzing collected data

As soon as the data processing is finished, and if possible, even before all of them are done, it is necessary to begin analyzing the results obtained. This analysis enables a primary verification through comparison with results of the previous year. If huge differences or incoherencies appear, it is indispensable to proceed to verifications to complete those already carried out at the time of the return of the data.

This new verification includes several elements (exhaustiveness, scope , definitions used, ...) which will allow to determine if there were undetected errors in the preceding phases.

In the same way as for data processing, it is necessary to take into account the human and material resources available. Of course, it is also a phase where

training could be given to the personnel who will be in charge of these analyses, because an excellent mastery of these data processing programmes is indispensable to correctly define the necessary statistical analyses. This data analysis has to be done rapidly to produce brief reports providing results drawn from the newly processed data.

It will then be completed by research on the different tables constituting the statistical yearbook, an important element in the dissemination of information.

Other analyses have to be carried out to respond to the expectations of different users -- they fall within the wider framework of information dissemination.

The indicators have to be the subject of very detailed analyses (cf. the explanation of this aspect of analysis in Chapter 5).

4.5.7 The dissemination - communication of information

The communication of information is essential to EMIS for it helps validate its operational capacities and its efficiency in the opinion of all the partners and users for whom the information is intended, and win their support.

This dissemination-communication takes different forms according to the people they are addressed to and their needs.

At the first level, when the information is intended for the managers of the education system, it is necessary to quickly provide them with the most recent information possible. It could be done in the form of a short and synthesized information report, tracing the evolution of the last results in their context.

At the second level, the information is transmitted to a much larger circle of users in the education system. Several communication reports can be used:

- a statistical yearbook on 'paper' and/or electronic support: CD-Rom or internet website. The mode of dissemination has to be developed as the access and use of these electronic tools develop. The yearbook has to include comments and brief analyses so as not to discourage the reader by the profusion of tables.

- The information reports devoted to a specific subject, as for example the evolution of enrolment ratios by region or the enrolment of girls or the

public-private distribution, etc. These reports review the precise question by mobilizing all the data available on this subject and by accompanying it with an expert analysis. They are intended for different services of the ministry and provide all the managers of the education system with updated statistical data. The list of subjects in these reports is established in collaboration with the different services of the ministry of education before the data processing, so that the processing and indicators could be adapted to them. If all the users of the ministry are satisfied because they receive the data they need within an acceptable time limit, EMIS improves its status and its indispensable quality.

- Access to information by request. When the database is operational and the computerization of the ministry is well-developed, the dissemination of information can be customized. This means providing the ministry's personnel with tools to interact directly with the EMIS database to obtain the information needed. This type of information transmission does not replace the previous ones but completes them, because it helps answer specific requests that cannot always be handled by the EMIS team. However, this customized access to information has to be accompanied by setting up a simple and user-friendly programme for users in order to facilitate their task without a heavy workload involved. For example, on an Oracle database, a computer programme like Business Object enables the users to start their own research.

- the publication of a document presenting a set of indicators describing the status of the education system: this is a fundamental aspect of EMIS. It is explained in Chapter 5.

Whatever the communication mode chosen (yearbook, specific reports, or direct access), the disseminated information should always be accompanied by precise explanation on the data and the indicators used in order to further the best understanding possible, and of course, to avoid wrong interpretations.

4.6 The spatialization of data in EMIS

4.6.1 Difficulties encountered

We have seen the different sources that supply EMIS with information. It is necessary, however, to examine the question of the availability of data and their

use at the regional or subregional level. This deals directly with the discussion on deconcentration/decentralization, and with the school mapping.

A majority of countries have an annual school census based on the information collected from each school establishment. All the geographical groupings are therefore possible for the continuous information in the school census. We will examine the access to these data and their use (at least their potential use) a little further on.

The problems and the questions deal, in this case, with the availability of information coming from other sources for the regional or subregional levels.

First, it is the question of the availability of present and projected demographic data since the last population census. Indeed, if the national data are in principle readily available and regularly updated, it is not the same case with regional and subregional data.

Close collaboration with the regional counterparts of the national institute of statistics is needed to solve this problem. It is to be noted that the problem of interregional migrations complicate the task of the institutes while the national level is not affected except by international migrations (the 'except' can certainly be an euphemism for some countries….).

Second is the problem of data based on survey by sampling. It is in fact rare that the results of these sampling are significant at the regional level and *a fortiori* at the subregional level.

It is generally an insurmountable challenge for it is very difficult to impose the requirement to obtain the regional significance in all the surveys by sampling.

4.6.2 The diversity of information collected and used at every administrative and geographic level

The relevance of information and its use strongly depend on the administrative and/or geographic level, and on the administrative organization.

Thus, very detailed information on such or such classroom has no significance except for the education establishment and the administrative level that has to manage its maintenance. The other levels have to only know the number of classrooms which have to be renovated or constructed.

It is therefore important not to circulate information unless it is available in a usable form, to avoid carrying out useless data collection, in particular at the level of educational establishments. In fact, it is at their level that requests for information most often take place. Here, one finds the indispensable coherence among and between the administrative levels on their requests for information from the education establishments. The absence of such coherence discourages the heads of the education establishments and saturates EMIS.

The need to analyze the relevant information according to administrative and geographic level will again present itself in the work on the indicators (cf. Chapter 5).

List of essential data to collect at the regional and the subregional levels:

Data on pupils

- Distribution by grade, gender and age
- Distribution of pupil repetitions by gender and grade
- For the first grade: distribution of repetitions by gender and age
- Number of students following the double shift per grade
- Average distance travelled by the pupils
- Number of students using the canteen
- Number of boarders

Data on teaching and non-teaching personnel

- Distribution of teachers by level of qualification and certification, by grade and by gender
- Distribution of teachers by age and by gender
- Number of teachers teaching double shifts
- Number of teachers in multi-grade classes
- Number of teachers receiving housing allocations
- Number of non-teaching personnel by category, age and gender.

School data

- Number of classrooms
- Number of classrooms to repair
- Number of school canteens

- Number of boarding houses

Population data

- Distribution by age and by gender of the population from 3 to 29 years old, by region, for all the years from at least the past ten years, and projections for at least the next ten years.
- Locating migrations: entry and exit from each region and its impact on the school-age population.

5. Indicators and data for the monitoring of plans

Sets of indicators are essential elements to the education management information system. This means that a good data collection tool needs to be accompanied by a set of relevant indicators to help guide and evaluate education policies. Thus, the quality of EMIS will often be judged according to the indicators that will be produced on their reliability, relevance and capacity to evaluate and manage the education system as a whole.

Every administrative or geographic level (school, region, or the country as a whole) needs to have a set of indicators. But as mentioned in the section on data collection, the list of indicators, as well as the needs for information, differs according to the level concerned. Of course a number of similar indicators can be found on the different lists drawn up by level, but, it is, for example, quite logical to find some indicators on daily management at the school level and few on planning, while at the national level, one would find all the indispensable indicators for the planning of the education system.

In developing a set of indicators, it is important for all levels concerned to follow the same procedure, that is:

- establish the education policy objectives that one wishes to manage or evaluate;
- draw from these objectives the most relevant indicators for this management and this evaluation;
- construct or complete the information system in order to make these indicators available.

5.1 The importance of indicators

A clear principle underpins the work of developing indicators: to promote the use of statistical information for the purpose of policy-making. If the collection of statistical data and their management is an important phase in the overall management of the education system, the same is true for the promotion of the use of these data, notably by rendering them useful to decision-makers. In all fields, rational decision-making requires the availability of objective information. Education planners all over the world are aware of this fact. As already mentioned, many countries have education databases that are regularly updated as a result of school census and other survey methods. Even if the quality and the reliability of these data are far from perfect, their use and their relevance for policy-making are clear.

However, policy-makers hardly ever consult these data to guide their education policies. The problem lies partly in the presentation and the dissemination of available data. The latter is often presented in classic statistical yearbooks in raw form and hence far from being usable tools to help the decision-maker who needs synthesized information based on analysis and relevance, and presented in a user-friendly form. The development of a regularly updated system of indicators is therefore fundamental for a better use of information.

Why develop indicators? It is because they make it possible to mobilize the available information and promote the use of statistical information. By synthesizing information, the indicators make them accessible and easy to use for policy-makers as well as for the whole education community. They therefore play an important role in the communication and dissemination of information.

In addition to this role of promoting information statistics, indicators are tools for managing, monitoring, and evaluating education systems. By describing the status of the latter, they help identify problems, define or redefine strategies, measure and evaluate progress made in relation to the education policy objectives. In short, as inputs to public debates, indicators can serve as a lever for improving the quality of education.

In summary, indicators constitute an important phase in the analysis of an education system. The system of indicators to set up has to function like a control panel -- it facilitates the identification of problems and measures their magnitude. It can play the role of a warning light that indicates any over-heating

in an engine. When the light goes on, the specialist has to find out why and then find the solution to the problem.

5.2 Preliminaries

Before a relevant system of indicators can be set up, two conditions have to be met: the presence of an information system and an existing education policy and/or education plan.

5.2.1 The presence of an information system

There is a dynamic between indicators and information systems. We know that a good data collection tool should be accompanied by a set of relevant indicators. And *vice versa*, without a good information system, it is impossible to build a good system of indicators.

The majority of countries have set up an education statistic information system integrated as a component into the planning and decision-making process.

This is a costly system. In addition, in many countries and particularly in developing countries, it is not always complete and still less, updated. For example, the information on the age of pupils is no longer available in some countries, which collected them before. Yet, this information is essential for the calculation of the net enrolment ratio and for analyzing the effectiveness of schooling at **a given education** level. Furthermore, to be useful, information has to be updated and should deal with the current school year or at worse with the previous year. However, many countries are not able to work within this constraint and yet, policy-makers who need to know the effects of their actions have to rely on these updated data. This being the case, using quick surveys on representative school samples, as indicated in Chapter 4, can accelerate the availability of data . These surveys, which allow the collection of a limited number of information showing overall evolution, should however be complemented by exhaustive surveys.

Reflecting on indicators makes it possible to improve weak (in volume and reliability) information systems. In fact, the publication of indicators constitutes a return of information to the people who are the producers of data (school heads, regional services….). Through it they can see the importance, usefulness, and the use of their data collection work, including areas requiring improvement

in terms of sufficiency or suitability. In short, publishing data and using the statistics effectively, can improve their quality.

5.2.2 An existing education policy and/or education plan

As tools that will enable the monitoring and management of the education system, the indicators to be defined and developed have to be based on the objectives and priorities set by the education plans.

Thus, in addition to providing a clear, relevant and synthesized description, the indicators should measure events or changes, of interest to the various agents of the education system. But then it is necessary that clear and measurable objectives for the education system be defined. These can be presented in different ways: through a plan, a framework policy, well-identified measures in education policy or in certain decrees, etc. The education objectives are found not only in the sector or subsector plans (ex: EFA action plan, basic education programme, etc.), but also in the wider development plans such as poverty reduction strategy programme where education constitutes a component.

When the objectives are clearly defined, the rest of the work consists in developing the most appropriate indicators to monitor and evaluate the proposed orientations. For example, at a certain time in Lesotho, a five-year plan was aimed to take 80% of a generation up to the fourth grade of primary education. The most operational indicator that was immediately defined in this case was the proportion of a cohort reaching fourth grade of primary education. Likewise for Benin where a quantified objective of the same type had been set, specifically to reach a gross enrolment rate of 78% in 2000 and a repetition rate of 15%. We can put under this same category of quantified objectives, the objective to reduce disparities between boys and girls, or increase the proportion of the budget devoted to basic education, and so on ……

When the objectives are more vague, such as "improving the quality of teaching", the work becomes trickier. It requires an initial definition of what quality means in the country concerned. In other words, what has to be measured: is it the qualification of teachers, the performance of pupils (results/learning achievement), the number of years spent at school, a schooling without repetition, a good pupil-teacher ratio, the content of the programmes, and how some subjects are included, a greater availability of teaching and learning materials, a safer school environment….?

Objectives such as "strengthening institutional capacities", "improving the school network" and "improving management support for teachers" are of the same nature[22].

Here one sees the importance of the debate, which will make it possible to draw up the list of indicators and all the difficulties encountered to transform a policy objective into indicators.

To conclude, if indicators help in decision-making, and if one has to link their development to an education policy, the two cannot be reduced to the same thing. In other words, the indicators do not determine nor define policies but help define strategies and implement policies. Thus, a policy cannot be reduced to a list of indicators. The latter measure the results of policies.

5.3 Some examples of objectives

To correctly evaluate a plan or a policy objective, it is essential to clearly define the objectives aimed for. The latter can be:

- quantitative: to achieve an enrolment ratio of 80% in the primary, reduce the repetition rate to 5%, achieve a pupil/teacher ratio of 45, etc, or
- qualitative: improve the quality of education, aim for more equality, improve the effectiveness or efficiency of the education system….

Many education policies or plans do not clearly define their objectives. Therefore, one needs to draw or extrapolate them from official statements and texts on education policy and have them endorsed and validated by the managers of these policies or plans.

Below are examples of objectives defined at different levels.

5.3.1 At the international level

The objectives defined at this level are for example those related to "Education for All" (EFA) set in the framework of the World Education Forum, held in Dakar in April 2000. Confronted with mitigated progress results since 1990, the

[22] Sauvageot, 1996, p.14.

Dakar Framework for Action reaffirmed the principles adopted in Jomtien and defined the following six Goals to be reached by all countries by 2015:

a) Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children

b) Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to complete free and compulsory primary education of good quality

c) Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes

d) Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults

e) Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality

f) Improving every aspect of the quality of education, and ensuring their excellence so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills.

If all the objectives remain similar to those defined in Jomtien in 1990, the action framework adopted in Dakar emphasizes other aspects of education such as the elimination of disparities between girls and boys in primary education and in access to secondary or even to non-formal education. These new objectives will need the development of other indicators to complete the list of 18 indicators already used during the evaluation of the Jomtien declaration in 2000

5.3.2 At the national level

The objectives contained in the Mali Ten-Year Education Development Programme (PRODEC) illustrates an example of defined objectives at the national level:

- Quality basic education for all;

- Vocational education adapted to the needs of the economy;
- Reformed and effective general and technical secondary education;
- Quality higher education responding to priority needs, with cost control
- Use of mother tongue as medium of formal education concomitant with French
- An operational book and didactic material policy;
- A continued policy for teacher training;
- A sense of partnership within the school;
- Restructuring and adjustment necessary to build up new foundations for the education system;
- A communication policy centred on dialogue and consultation with all partners;
- A financing policy for the development of the education system taking into account the mobilization of funding sources of decentralized local authorities and communities.

This type of plan allows a clear identification of objectives because it specifies all the aspects on which this education development policy would like to intervene.

Here is another example of objectives that one finds in the education policies of some countries:

- Qualitative and quantitative development of primary education;
- Universalization of access to education
- Raising the NER (net enrolment rate) of 66.2% in 1989/90 to 80% in 2010;
- Increasing education supply;
- Improving the quality of teaching;
- Consolidating the internal efficiency of the system;
- Improving the supervision of teachers;
- Improving facilities and training;
- Improving the qualification of teachers;
- Attaining equal opportunity between girls and boys and by zones;
- Reducing regional and gender disparities;
- Increasing basic education's share of the budget;
- Cost control
- Defining new strategies to control rising costs;
- Improve school management

These objectives relate to four themes: access to education, quality of teaching, disparities, management and finance. Some are more precise than others. Thus, the difference between "improving the quality of education", a rather vague objective, and "improving the qualification of teachers", a more precise objective, is evident.

5.3.3 At the regional level

In addition to objectives which need to be measured at the regional as well as the national level, some objectives can be more specific and very much linked to the organization of the country, notably deconcentration/decentralization.

Thus for example, if it is the region, which has to manage the replacement of teachers in secondary education, it is important, on the part of the region, to measure its capacity to replace the absent teachers to pursue the objective minimizing unreplaced teaching positions.

In the same manner, if the school-map has to be constructed by region, it is important for the latter to know the average distance travelled by the pupils to reach the school. The objective associated in this case is to shorten the distance the pupils have to travel , or organize, when possible, a school bus system to help transport pupils living in remote areas.

5.3.4 At the school level

The school needs a good knowledge of the population it serves and those it does not serve, in other words, out-of-school children in its recruitment zone.

It also needs to consider the facilities it offers to pupils and teachers. It has to know, for a secondary education establishment for example, if it needs to provide the students and teachers with a library, a documentation centre, or a meeting place.

It also has to deal with the absenteeism of pupils and that of teachers.

School 'atmosphere' (work ambience, quiet and efficient environment….) is important and influences the performance of pupils.

From these examples, we can draw some associated objectives:

- to build a library or a documentation centre, which is open as much as possible to pupils and teachers;
- reduce pupil's absenteeism;
- reduce teacher's absenteeism and particularly unreplaced absences hence improve the liaison with the administration responsible for these replacements;
- bring down the number of days when the school is closed outside school holidays (for reasons of, for example, the organization of examinations…..);
- facilitate the use of textbooks;
- improve the school atmosphere.

5.4 Moving from objectives to indicators

The development of indicators presupposes that one knows clearly and precisely what an indicator is. Indicators are tools which make it possible both to characterize the state of the education system and also to report on that state to the whole of the education community, in other words to the whole of the country.

An indicator is a synthetical and analytical information. It is certainly not basic information or raw data. It is processed information to study an education phenomenon. Therefore one should not confuse a list of indicators for a list of tables produced for a statistical yearbook or to meet management needs. The number of pupils entering secondary school is of interest to the managers, as are the numbers of teachers and of pupils. But the indicator in the first case will be the proportion of a cohort gaining access to secondary school, while in the second case, it is the pupil/teacher ratio. The difference is clear, and so is the difference in analytic potential.

It is often very tempting to add crude data to indicators. This distortion must be avoided, in order to preserve the appropriate character of work with indicators.

The identification of indicators is a function of the objectives of the education policy. In fact, once a preliminary list of objectives is identified, a set of indicators should be attached to each objective. Naturally, the same indicator can be used for several objectives.

The purpose of the examples below is more illustrative than exhaustive.

The 18 core EFA indicators

- **Indicator 1:** Gross enrolment in early childhood development programmes, including public, private, and community programmes, expressed as a percentage of the official age-group concerned, if any, otherwise the age-group 3 to 5.
- **Indicator 2:** Percentage of new entrants to primary grade 1 who have attended some form of organized early childhood development programme.
- **Indicator 3:** Apparent (gross) intake rate: new entrants in primary grade 1 as a percentage of the population of official entry age.
- **Indicator 4:** Net intake rate: new entrants to primary grade 1 who are of the official primary school-entrance age as a percentage of the corresponding population.
- **Indicator 5:** Gross enrolment ratio.
- **Indicator 6:** Net enrolment ratio.
- **Indicator 7:** Public current expenditure on primary education a) as a percentage of GNP; and b) per pupil, as a percentage of GNP per capita.
- **Indicator 8:** Public expenditure on primary education as a percentage of total public expenditure on education.
- **Indicator 9:** Percentage of primary school teachers having the required academic qualifications.
- **Indicator 10:** Percentage of primary school teachers who are certified to teach according to national standards.
- **Indicator 11:** Pupil-teacher ratio.
- **Indicator 12:** Repetition rates by grade.
- **Indicator 13:** Survival rate to grade 5 (percentage of a pupil cohort actually reaching grade 5).
- **Indicator 14:** Coefficient of efficiency (ideal number of pupil years needed for a cohort to complete the primary cycle, expressed as a percentage of the actual number of pupil-years).
- **Indicator 15:** Percentage of pupils having reached at least grade 4 of primary schooling who master a set of nationally defined basic learning competencies.
- **Indicator 16:** Literacy rate of 15-24 year olds.
- **Indicator 17:** Adult literacy rate: percentage of the population aged 15+ that is literate.
- **Indicator 18:** Literacy Gender Parity Index: ratio of female to male literacy rates.

5.4.1 At the international level

The monitoring and evaluation of the Education For All objectives defined in Dakar (see section 5.3.1) will be based on the list of 18 fundamental indicators used for the EFA assessment in 2000.

This list however should be transformed in the light of the Framework for Action adopted in Dakar. In fact, these indicators should not only represent the access to compulsory, free and quality primary education for all children, whatever their gender, their socio-economic situation and their ethnic group, but should also show that these children complete this education. In addition to the access and enrolment rates (gross and net), which are already available, other indicators will be needed to measure the achievement of the primary education cycle (completion rate) as well as the availability of compulsory and free education (not only legally but in actual fact).

It is also necessary to measure the access to and participation in secondary education and adult education programmes, and to ensure that this access and this participation are fair. In this regard, the realization of the notion of gender equality in education, which goes beyond the idea of parity, as well as its measurement, is a challenge that needs to be faced eventually.

Finally it is necessary to measure reading, writing, and numeracy skills achieved and to specify and measure indispensable life skills as well as the quality of education.

In order to do so, it is indispensable to improve the information system not only on those parts concerning the new EFA objectives, the non-formal ways of providing education, but also those where the statistical assessment for 2000 have shown gaps in the following:

- education financing - the necessity to take into account the sources of private and non-governmental financing and to improve the coverage and quality of related information.
- demographical statistics - the necessity to solve the problem regarding the differences between national estimates and those produced by the United Nations which can sometimes be considerable leading to significant uncertainties on the reality of enrolment rates and the number of out-of-school children.

We can summarize the actual situation by highlighting the EFA/Dakar objectives and the existing EFA indicators to monitor and evaluate them.

a) Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children: **Indicators 1 and 2 covering all children but also its calculation on the sub-group 'most vulnerable and disadvantaged children'.**

*b) Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to complete free and compulsory primary education of good quality***: Indicators 3, 8 and 13.** Other necessary indicators: the completion rate of primary education; the indicators measuring the adoption and the application of free and compulsory primary education. Here, it is also necessary to identify children in difficult situations and minority ethnic groups.

c) Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes: **Indicator 16** could be a proxy but needs to be complemented. This objective is one of those whose measurement requires consistent methodological work. In any case, it is advisable to define and measure the importance of these programmes. This necessarily takes place through the improvement of collected statistics by the countries themselves.

*d) Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults***: Indicators 17 and 18.** Same remarks as for the preceding objective.

e) Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality: **Indicators 3, 6, 13, and 15 by gender.** In addition to these indicators which only concern primary education, it will be necessary to use the indicators of access to and participation in secondary education such as, the transition rate by gender from primary to secondary education, the gross and net enrolment ratios in secondary education, gender participation in technical and professional education,

the percentage of youth leaving the system without qualification, etc. Finally the monitoring of this objective requires that one should go beyond the indicators measuring the parity to take into account the notion of equality in education. In fact, parity does not always mean equality of treatment and opportunities.

f) Improving every aspect of the quality of education, and ensuring their excellence so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills: **Indicators 9 and 14.** These indicators are approximations (proxies) and do not take into account other aspects of quality such as the content of programmes, the quality of process and methods of training, class hours, availability of didactic material and books, the school environment (quality of buildings and equipment, safe and secure environment for the children in particular for the girls, etc.), etc. which are also just as important for improving the quality of education.

As one can see, some objectives or problems are not easily translated into indicators. They therefore require an appropriate research work that aims to translate the identified problems into specific questions. Objectives such as "to provide life skills to all young people "or" to improve the quality of education in all its aspects" fall under this category.

The qualitative aspects of these concerns reveal the weaknesses of purely quantitative indicators which are limited in the qualitative description of the education system and in their capacity to analyze and define its functioning. It is therefore urgent to place particular emphasis on these aspects. It is certainly possible to find quantitative indicators that take into account these qualitative phenomena. However, the difficulty to find a consensus on the notion of quality, the complexity of the evaluation of qualitative characteristics, the feasibility and the cost of the necessary data collection are some of the reasons which explain why these qualitative indicators are weakly developed at present. It is however not a justification for ignoring these concerns. On the contrary, it is necessary to provide oneself the means to find appropriate solutions to describe and measure each of these qualitative aspects.

5.4.2 At the national level

The following examples from Mali and Lesotho, show different educational concerns which are linked to the level of development of their education system. Mali, the first example, has clarified the objectives presented in its ten-year

programme by elaborating an action plan. The action planning has facilitated the definition of indicators associated with the objectives because each objective contains in most cases the indicator required to monitor and evaluate the objectives defined in the ten-year programme:

- Increasing early childhood enrolment ratio from 1.5 % to 3.8% in 2002;
- Increasing enrolment ratio from 43% to 61% in 2002 while reducing the disparities between regions and between towns and villages;
- Increasing the enrolment ratio of girls from 34% to 52% in 2002;
- Increasing the enrolment ratio in special education from 0.5% to 2.75% in 2002;
- Allowing out-of-school youth aged 9 to 18 years to have access to a minimum training programme by 2008;
- Increasing adult literacy rate of 23% in 1996 to 36.5% in 2002, of which, 23% for women (against 7% in 1996);
- Building and furnishing 11,000 classrooms by 2002;
- Building/restoring 8 teacher training institutes (IFM) by 2002;
- Orienting 23% of basic education graduates (DEF) to vocational education in 2002;
- Building/restoring 10 buildings for vocational training by 2002;
- Building and equipping 10 lycées (high schools) by 2002;
- Improving the pupil/book ratio;
- Using mother tongue as the medium of teaching in the first years;
- Recruiting and training new teachers per year of 2,450 for basic education, 1,419 trainers for vocational education and 2,059 for general and technical secondary education
- Retraining 7,300 basic education teachers, 1,152 secondary education teachers and 64 for teacher training by 2002;
- Increasing the proportion of the state budget devoted to education to 27% in 2002.

Below is a list of objectives and indicators established for Lesotho. To each of these eight objectives there are corresponding indicators (36 in total):

The objectives identified for Lesotho were as follows:

- Making the education system more efficient;
- Improving the state of facilities and the availability of teaching materials;
- Enhancing pedagogical support of teachers;

- Improving the quality of teaching;
- Improving the management of resources and costs;
- Reducing over-crowded classrooms;
- Improving the management of the education system;
- Improving the achievement levels of pupils.

Remarks:

Lesotho is very concerned about over-crowding in its classrooms and as a remedy, it wants to restrict school entry for pupils who are either overaged or underaged. Consequently, Lesotho clearly indicated this objective, and constructed four indicators to measure it: number of pupils per classroom, percentage of underage pupils in first year, percentage of overage pupils per year of studies, and the pupil-teacher ratio. It will carefully monitor their evolution, in order to verify whether the objective of reducing the number of pupils per classroom is being achieved, and whether pupils are enrolled at the right age.

Mali did not formulate such an objective. Its main problem is the development of intake capacity and one can see that there are many indicators (as many as 7) to measure this objective.

This clearly shows how important the given country's orientations and problems are for the definition of objectives and the choice of indicators.

Lesotho, which has a higher enrolment level, is more concerned about the quality of education and hence concentrates, for example, on learning achievements. This is not the case of Mali, which has retained four indicators to measure the development in enrolment. In addition, the enrolment of girls in Mali is half that of boys, hence the country's objective of developing the enrolment of girls. Lesotho by contrast is one of the rare countries in Africa where the enrolment of girls is higher than that of boys. Furthermore, seventeen indicators in Lesotho measure the efficiency of teaching. This is explained by the fact that Lesotho has to produce well-trained young people who can then easily find work in South Africa, for almost 50 per cent of Lesotho's GNP consists of the revenue of workers employed in that country. Equipment and costs are mentioned in both countries.

The indicators retained to monitor the objectives should be linked in a logical and empirical manner. These links should come from a reference model or framework describing the operation of the education system. The structure of

this operational model, whose aim is to avoid the disorderly accumulation of indicators, can vary by country and level of analysis, but it will in general assemble the elements of information concerning which ones enter into the system - *the inputs* - , the conditions of teaching, - *the process* -, and the results or the "outputs" - *the learning achievement* -, the number of graduates, etc. Based on the different dimensions of the model, one will determine the best-adapted indicators[23].

Table 4: Moving from objectives to indicators (Lesotho: Indicators by objective)

	Equip-ment	Over-crowding	Manage-ment	Enrol-ments	Effi-ciency	Results	Quality	Costs
Percentage of pupils in classroom	x							
Pupils/classroom ratio		X						
Percentage of underage pupils in standard 1		X						
Percentage of overage pupils		X						
Net admission rate				x				
Net enrolment rate				x				
Repetition rate					x			
Percentage of pupils completing standard 3					x			
Percentage of pupils completing standard 7					x			
Percentage of pupils gaining PSLE					x	x	x	
Availability and use of syllabus					x		x	
Availability and use of guides					x		x	
Availability and use of textbooks					x		x	
Use of pedagogical guidelines					x		x	
Use of radio					x		x	
Number of pupils seated at desk	X				x		x	
Pupils/teacher ratio					x		x	
Qualification and experience of teachers					x		x	
In-service training					x		x	
Upgrading programme for teachers					x		x	
NTTC graduates					x	x		
Attrition rates					x		x	
Teachers in hardship areas	X						x	
Housing for teachers	X						x	
Professional support of teachers					x		x	
Management by inspectors			x				x	
Activity level of school committee			x					
Total expenditure for education as a percentage of GDP								x
Total expenditure for education by school level								x
Sources of funding for educational institutions								x
Public expenditure on education as a percentage of total public expenditure								x
Expenditure per school pupil								x
Expenditure per school pupil in relation to per capita GDP								x
Expenditure per school teacher								x
Expenditure per school teacher as a proportion of per capita GDP								x
Sources of payment for teachers								x
Source: Ministry of Education, Lesotho. *Primary education in Lesotho, Indicators 1992.* Paris: UNESCO/International Institute for Educational Planning, p.38.								

[23] IIPE/UNESCO, *Education Management Information System. Module 2: Identification of information needs and building indicators.* Paris, 2000.

5.4.3 At the regional level

It is certainly justified to use the same indicators developed for some national objectives if the same objectives are taken up at the regional level. Thus, one finds indicators on the net enrolment ratio, education expenditures, teachers' qualifications. For more specific objectives mentioned as examples in paragraph 5.2.2, one can cite the replacement rate of absent teachers and the corresponding non-replacement rate.

It is also useful to calculate an indicator on the average distance pupils have to travel to go to school.

Example: "*Géographie de l'école en France"* (an annual publication of the French Ministry of National Education, Directorate of Evaluation and Prospection)

<table>
<tr><th colspan="2">List of indicators of "Géographie de l'école"</th></tr>
<tr><td>The economic and social environment
The demographic changes
Social and economic structure
The wealth of regions and households
Unemployment and lack of job security</td><td>Human resources
Expenditures of the Ministry of National Education and of regional communities
Grant holders
Supervision of pupils at the primary level
Supervision of pupils at the secondary level
The teaching staff
Personnel at the administrative, technical and supervisory level</td></tr>
<tr><td>Education supply</td><td>School careers</td></tr>
<tr><td rowspan="2">The evolution of school enrolments
Education supply at the first level
Education supply at the first cycle of the secondary level
Education supply at the second cycle of the secondary level
The weight of higher education
Entry flows to higher education
Private teaching institutions
Priority education
Facilities for pupils</td><td>The enrolment of young people aged 16-24 years
Repetition rate in secondary education
Graduation flows from the secondary education
The enrolment of girls
apprenticeships and employment/study alternation contracts</td></tr>
<tr><td>Results
School achievements at the entry to first grade of secondary
Proportions of general, technological and vocational secondary graduates
Successful examination results
The situation of young people seven months after their break with the education system
Type of institutions</td></tr>
</table>

5.4.3 At the school level

In order to measure the performance and the work conditions of teachers, it is important to know the 'atmosphere' within the school establishment. The indicators below can be useful:

- average school working hours, number of options offered (in secondary schools), class size and class sections;
- number of housing facilities for teachers, teacher characteristics;
- number of transfers requested by school teachers (related to the number of teaching posts for example);
- number of requests from teachers to join the school, a measure of the school's attractiveness
- acts of violence and their seriousness can also be an issue

It is also interesting to have some indicators on the school environment:

- the enrolment ratios in the school district;
- the main characteristics of the population living in the school district;
- the relations between the school and the economic activity of the region: visits to enterprises, twinning, etc., which are very important for technical and vocational schools.

An example of indicators for the second cycle of secondary school

Indicators about the school population

- Characteristics of pupils present at the beginning of school: sex, average age, socio-professional category, proportion of overaged pupils , proportion of foreign pupils, proportion of repeaters;
- Characteristics of pupils entering the lycée at the beginning of school: sex, age, proportion of repeaters, proportion of pupils coming from private schools;
- School origins of pupils entering the lycée at the beginning of school.

Resource and input indicators

- Teaching hours;
- Characteristics of teachers;
- Pupil enrolment by option.

Result indicators

- Success rate in the baccalaureate (matriculation) by stream;
- Rate of access to the baccalaureate;

- Proportion of baccalaureate holders among those leaving the school;
- Situation of pupils seven months after their departure from the education system;
- Acquisition level of pupils in French, mathematics, history-geography and a modern language.

Operation indicators

- Orientation of pupils at the end of the first grade of lycée;
- Proportion of teaching hours actually taught to each pupil;
- Class size;
- The importance of teaching related services;
- The importance of school life related services;
- Turnover of the teaching staff;
- Accidents in the school;
- Status of the lycée pupils

Environmental indicators

- Intensity of relations with the economic environment;
- Socio-economic data by employment zone.

5.5 Mobilization of available data sources and calculation of indicators

Once the indicators have been identified, the next step is to assemble all the necessary data for their calculation. It is important to establish a list of existing data sources and to link each indicator with the basic data mobilized for its calculation and with the sources related to these data. One can then realize the difficulty, even the impossibility to calculate some of them. An interaction therefore is established between the indicators and the data sources, the absence of data could lead to a new data collection to allow for its calculation. But sometimes, the persistent impossibility of calculating an indicator can lead to its elimination and its replacement.

It is equally indispensable to explain the concepts and formulas of the calculation used for each indicator, in short, to constitute a **glossary.** In fact, the same wording of indicator can hide differences between countries but also within the same country in different time periods. The changes in personnel, in information gathering, in concepts, make the formalization of the definition and calculation of each of these indicators necessary. If this formalization is not made, the risk of obtaining indicators calculated on variable fields with different formulas of calculation, is great. It is important to remember this point in order to ensure the quality and the continuity of EMIS.

We can refer to Chapter 4 for obtaining details on the data sources available. As an example, below is a detailed explanation of some calculation formulas and used sources (Mali 1992) [24]:

Name: Net Admission Rate

- **Objective:** To assess increase in admission capacity
- **Level:** National and regional
- **Breakdown:** by gender
- **Calculation method:** Number of new intakes in a cycle / Population of theoretical entry age in the cycle (Example: 1st cycle = 7 years-old)
- **Source:** Inspectors' report
- **Validity:** Good
- **Frequency:** Yearly

Name: Gross enrolment ratio

- **Objective:** To measure increase in enrolments
- **Level:** National and regional
- **Breakdown:** by gender
- **Method of calculation:** Total number of pupils of a cycle / Population of theoretical age of cycle (Example: 1st cycle = 7 to 12 years-old)
- **Source:** Inspectors' report, demographic data of the National Institute of Statistics
- **Validity:** Good
- **Frequency:** Annual

Name: Net enrolment rate

- **Objective:** To measure the intensity of enrolment
- **Level:** National and regional
- **Breakdown:** by gender
- **Method of calculation:** **N**umber of pupils enrolled in a given age group / Population of this age group
- **Source:** Inspectors' report, demographic data of the Institute of National Statistics
- **Validity:** Good
- **Frequency:** Annual

[24] Cited in Sauvageot, IIPE, 1996, page 34.

Likewise, below are some examples and definitions assembled in a glossary[25]:

Basic Education: It consists of nine years of study (grades) which are divided into a first cycle of six years of study and a second cycle of three years of study.

School: Administrative unit where teaching takes place.

Private education: It includes catholic schools, secular schools and basic schools.

Basic school: A school created on the initiative of a community or a local group, of a young graduate or a young worker coming from the education sector.

Madrassa: A basic education school born of private initiative following the example of Koranic schools. The medium of instruction is Arabic. French is a teaching subject like arithmetic, history, geography, etc., introduced in the third grade.

Classroom: Any building attached to a school used to accommodate a class.

Number of pupils per class: The average number of pupils in a class.

Multigrade classes: Classes where pupils of different grades are grouped together (at least two)

Double shift: The accommodation in the same classroom of two different groups of pupils in the same day, at different hours.

Gross admission rate: The proportion of new entrants in a school cycle, whatever their age, related to the legal population entry age in this cycle (7 years-old in the first cycle, 13 years-old in the second cycle).

Pupil: A child enrolled in full-time education; the figures are taken from the attendance register.

Teacher: Any person teaching full-time in basic education. The annual survey includes teachers temporarily absent, e.g. on sick leave. Any teacher on leave for a period of more than six months should not be included.

Having explained the definitions and the methods of calculation, it is necessary to verify the validity and consistency of the final results.

[25] Cited in Sauvageot, IIPE, 1996, page 35.

The calculation of indicators has mobilized different data sources and required many steps. It is therefore indispensable to verify the final results and to ensure its consistency with the comparable data or values of these indicators in previous years. This is an indispensable phase. If this procedure is neglected, the risks of inconsistencies and errors could be great and could damage the credibility of the whole EMIS. It is therefore a very important point to take into consideration.

5.6 Structures to be set up to develop a system of indicators

The work on indicators is an important component of EMIS. It should be organized as a project with a very precise objective and timetable. To carry out this project well, it is useful to aim for a large and diversified distribution of all identified indicators. This point will be discussed in detail in the following paragraph but this dissemination should be a formative element of the EMIS 'indicator' project.

A project leader must be designated from the very outset[26]. This is the person who will motivate the various structures set up or mobilised by the project. He/she will have good experience in the statistics field and good analytical skills of the education system. Moreover, he/she will be capable of steering a project of this type from its inception right through to final publication.

The project must be integrated into existing structures and will constitute an important lever in the setting up and sustainability of EMIS. For the first wide dissemination of indicators, the existing services will organize themselves to ensure the best possible functioning of EMIS.

The list of indicators must be constructed with the close involvement of the various actors responsible for the preparation and implementation of education policy. This choice of indicators must be the subject of discussions among senior officials of all the units involved. For this work on indicators, it is therefore often very useful to constitute a monitoring or steering committee, consisting of representatives of all these entities. This group can be made up of members from different ministries, whenever, for example, higher education and vocational training come under other ministries. The point is to report on

[26] The following paragraphs draw inspiration from Sauvageot, IIPE, 1996–2003 pages 39-40…

the whole of the education system, and not just the activities of one ministry. Once the steering committee has identified the main orientations and the objectives to be measured, a working group, consisting of a small number of experts and chaired by the project leader, must do the actual implementation work. All aspects of the work should be taken up.

In summary, two groups are required: a project steering committee and a working group responsible for implementation. This is quite typical for project management, and is indispensable. Deadlines should be clearly defined, with strict timetables for the production of indicators by the working group, and for policy validation by the steering committee.

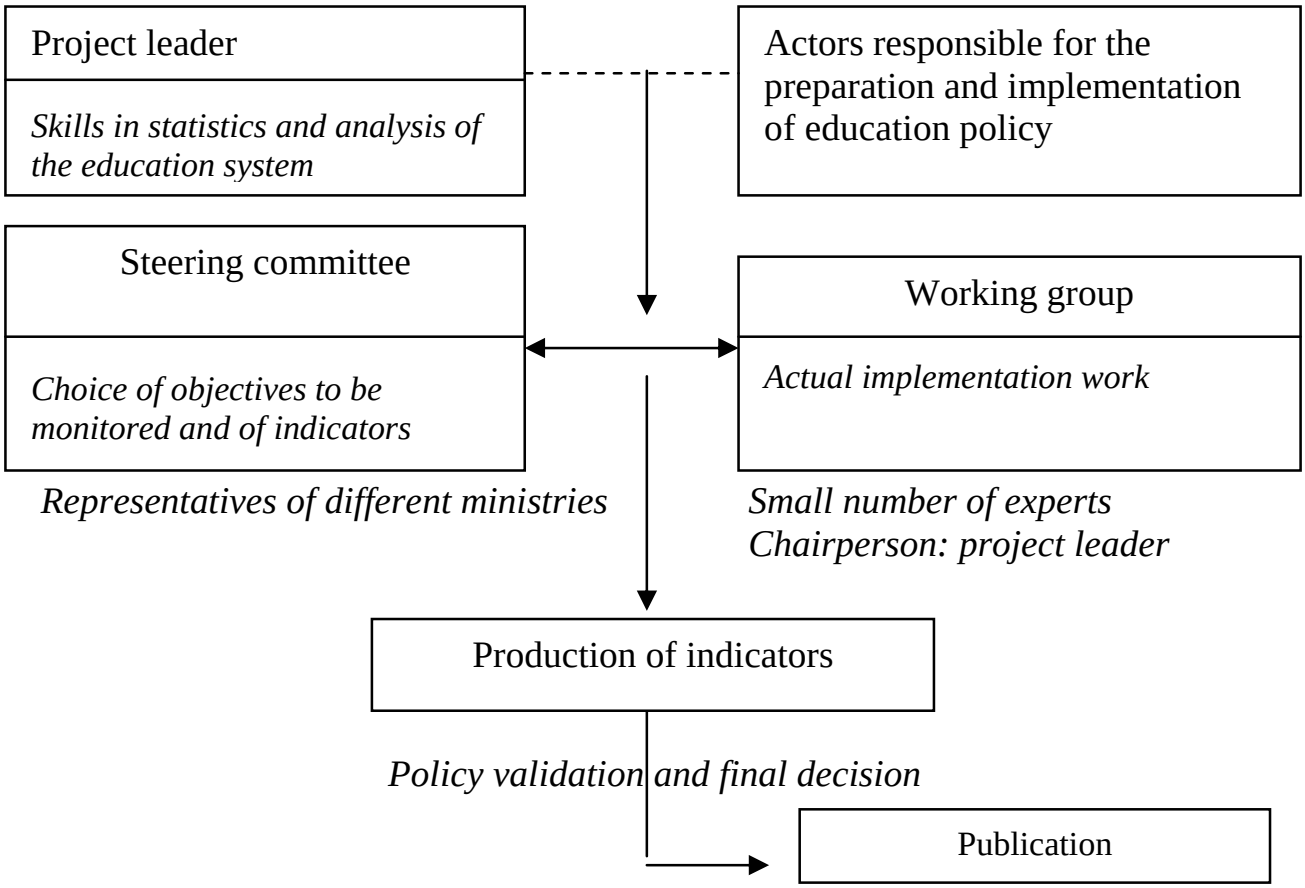
The total duration from the project's beginning to the publication of a first issue of the document must not exceed twelve months, and in no way, eighteen months, for the implementation deadline should be short in order to involve and mobilise all the necessary energy.

Two or three meetings of the steering committee are enough to finalize a definitive list of the indicators to appear in the publication. Only substantial and unforeseen problems of data availability can then put into question the list validated by the steering committee.

After this validation, the steering committee becomes involved again during the final discussion of the document before its publication. For the sustainability of the operation, it is indispensable that the concerned entities of the ministry or ministries be involved.

After the first edition, it is necessary to prepare the second one, which is of capital importance for the project's success. If the operation ends after the first issue, the purpose is missed. Since it is always the regular services of the administration that will produce the document, the project design must involve them from the outset (this has already been mentioned), so they can be quickly absorbed into the regular administration. Naturally, there will still have to be an editor-in-chief, as successor to the project leader.

Figure 1. Structural Set-up



5.7 Analysis and presentation of indicators

Once the indicators have been calculated, it is necessary to prepare the layout and analyses which should accompany the tables and graphs containing the indicators.

One clear requirement to keep in mind: simplify and make these indicators accessible to all publics. This is not easy and demands a lot of effort and technical skills in the layout and analyses. But since it is one of the most visible parts of EMIS, it is of major importance.

One has to be careful to avoid the many traps present in the layouts that have been retained[27].

The external image of EMIS depends on the quality of this publication and one will easily understand why a lot of effort should be devoted to this part. Fortunately, microcomputer tools available today largely facilitate the work[28].

5.8 Use and publication of indicators

Different types of support can be used for the publication: 'paper' support, CD-Rom, website…..

The layout can change according to the method of publication chosen.

If 'paper' publication is selected, the double-page system is recommended[29].

If publication on CD-Rom or on the website is selected, it is advisable to exercise care in the ergonomics and the presentation of results.

In any case it is indispensable to make this work on indicators visible and to make it accessible to all the target publics.

Naturally, the different supports can usefully complete one another. A presentation which is difficult to do on 'paper can benefit from illustrations through microcomputer programmes, a good results presentation on 'paper' is a good 'publicity' for the work on indicators and consequently for EMIS.

Depending on the type of indicators and geographic level, one can address the managers of the education system (decision-makers, administrative personnel, teachers) or the whole population for the sake of transparency and to report to the whole country on the functioning and results of the education system. But in all cases, the initial requirement of the construction mentioned before (paragraph 5.7), remains.

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[27] Sauvageot IIPE, 1996 - 2003, pages 49 - 58…

[28] Sauvageot IIPE, 1996 - 2003, pages 58 - 64

[29] See 'The status of schools in France *"L'état de l'école en France"* or the indicators of Mali.

5.8.1 Using the document for internal and external evaluation: the need for transparency

The publication of such a document is proof of the will to instil transparency about the functioning of schools in a country. That is why the decision to publish is political and for this reason, it is necessary to win the support and approval of the minister. It is he/she who must approve the final document, and even better, write a preface for it.

This is not always easy to achieve, but it is of utmost importance. It is necessary to convince political decision-makers of the need to disseminate this information widely, and to avoid, as has sometimes occurred, having documents of this type end up in (occasionally locked) cupboards.

Once published, the document must be distributed widely, and must contribute to the debate about schools. Therefore, it must be available to politicians (ministers, elected representatives, etc.), to those in charge of the education system, to parents' associations, to teachers' trade unions, to school directors, and to the administrative and technical staff of schools, without forgetting the press and the general public.

The goal is to turn it into a reference document for political discussion and the media. This is an ambitious objective, but it is the right one to set for this project.

Naturally, the success of this operation will not be ensured unless the publication of the document accompanies or follows a clear transformation in the way in which decisions are taken: the culture of objective data must be disseminated and developed. In the absence of such a change, the document loses value and no doubt becomes less useful. In the past, documents of the same type have appeared, and then disappeared for lack of a genuine impact. Here, the ball is in the decision-makers' court. The producers of the document must do everything to demonstrate its utility, and, as has already been suggested several times, to design it in such a way that it becomes a *sine qua non*. A good example of success in this respect is France's *L'Etat de l'école,* which has managed to become the indispensable tool in any political or social discussion about schools in France.

5.8.2 Updating the publication of indicators

It is not a matter of publishing this document once, and considering it a *fait accompli*. In order for it to be useful and used, this document must become a good habit, and there is only one way to achieve this, namely to publish it very regularly, in order that the most recent data be always available.

Regular production of the document must therefore be organized. This has certain consequences for the organization of the work, for data collection, and for all operations concerning the production of indicators.

Computer equipment makes it possible to update text, tables and graphs relatively easily. With this end in mind, the data should be organized appropriately in the spreadsheet, and the same page layout retained. The updating should be done as soon as new data are available. One can, of course, envisage automatic procedures, but they can sometimes be more cumbersome to implement than manual updating. Such procedures should be carefully analyzed before investing in automatic updating.

The ideal, of course, would be to rapidly move to annual publication. This should be the objective.

As indicated previously, the editor-in-chief will replace the project leader. For the operation to become a routine, it must be completely immersed in the concerned departments of the ministry. Obviously, the role of the editor-in-chief remains essential. He/she is the guardian of the document's quality and homogeneity, and ensures that distortions are avoided, including those due to the success of the first issue, such as a demand for more information or more indicators, to the detriment of their quality, etc.

5.8.3 Other uses: International, interregional, or inter-school comparisons

Once these calculations are done, verified and validated, it is interesting and instructive to compare the results with other geographical units.

National indicators can be compared with the same indicators of other countries, regional indicators with those of different regions, and school indicators with those of other schools.

For these comparisons to be pertinent however, it is necessary to ensure that indicators of different entities (countries, regions, schools) be calculated by

using the same definitions and the same rules of calculation, failing which comparisons will be faulty and therefore unusable.

It is very important therefore to respect the same rules and definitions when making comparisons. Once again the importance of nomenclatures is emphasized, this common language indispensable for data collection and consequently, for calculating indicators.

These very useful comparisons are becoming more and more appreciated by policy-makers. If all is well, the comparison is flattering, but it is not the same otherwise. For this reason, it is indispensable to ensure the validity of comparisons, for if one is sure of the validity of results, it is easier for the technician to assume or explain its pertinence or its limits. This also means enabling the policy-maker, the regional manager, and the school director, to develop a culture or knowledge of evaluating the system. The initial steps in this field maybe difficult but the conduct of a (national, regional, school) policy improves a lot through regular evaluation. Accepting this evaluation, using these results are the basis of a true democratic policy based on transparency. Some progress has been made in this field, but there is still **a long way** to go and the pitfalls are many. The development of international and national works on indicators can contribute to this edifice on the condition that these rules are accepted and respected which guarantee the validity of these comparisons. It is then possible, up to a given level, to complete the results obtained with indicators coming from other countries or other regions or other schools. Averages and medians calculated on given entities can also be provided which can serve as reference for entities of the same type.

Examples:

- national or regional reference for a school indicator;
- average of the countries of the same geographic zone for a national indicator

Some examples of comparative analysis:

- at the international level, the works of OECD on the project INES (Indicators of Education Systems) and on PISA (Programme for International Student Assessment), of UNESCO on Education for All (including the evaluation of students within the framework of the MLA project (Monitoring Learning Achievement)), on the CONFEMEN

(*Conference des ministres de l'Education des pays ayant le français en partage/*Conference of Ministers of Education of Francophone Countries), with the programmes PASEC (*Programme d'analyse des systèmes éducatifs de la CONFEMEN/*Programme of analysis of education systems in Francophone countries, in the framework of CONFEMEN, on Eastern and Southern African countries with SACMEQ[30](Southern African Consortium of Monitoring Educational Quality)…..

- at the regional level, one can consult *Geographie de l'école en France*[31]
- at the school level, the performance analysis of lycées *vis-à-vis* the baccalauréat in France'[32].

[30] Refer to the publications of these different organizations.

[31] *Géographie de l'école*, annual publication of the French Ministry of National Education since 1995.

[32] Three performance indicators of lycées. Annual publication of the French Ministry of National Education. From 1994 to 1997 in the form of published documents and on the Minitel, and now available on the Internet.

6. Different stages in the implementation of an efficient EMIS

6.1 Assessing a country's situation regarding information systems

Before conducting any EMIS operation, it is necessary to carry out an assessment of the existing situation of all the sub-sets of EMIS (cf. chapter 2).

This assessment must be conducted like a real project, and be managed by a person competent in organizational skills, statistics, computers and telematics. The project should mobilize people and institutions in the setting up or the improvement of EMIS.

A good procedure to follow is to establish a list of the necessary indicators to monitor the identified education policy objectives of the country. The calculation of these indicators requires a certain number of databases. One can therefore compare the necessary database for the calculation of the indicators with the actual information available in the whole information system: annual census, evaluation of pupils, specific surveys. One can thus identify the gaps to be filled in. A strategy and a timetable to collect the missing data should then be developed.

As regards the available data, their principal characteristics should be analyzed: data reliability and rapidity of collection. Since the basis of the system is the school or the educational establishment, it is necessary to analyze the way information is collected, and the rapidity of its circulation between different administrative and geographic levels.

This analysis makes it possible to identify the difficulties in collecting and circulating information: analysis of the organization of the ministry - links between raw statistics and management tools - links between different institutions and the time-lag in making the information available.

From this double diagnostic (gaps in the information system, problems in the collection system in place), solutions must be identified and an operational plan and a precise timetable set up.

This operational plan should naturally cover all the sub-sets of EMIS. It will completely depend on the EMIS' level of development observed in the country being studied.

Let us examine several situations as examples:

6.2 What should be done in an almost complete absence of data?

A steering committee should be set up around the EMIS project leader composed of representatives from the statistical and management services who have data (for example the directorate of the teaching personnel or the directorate of administration and finance). This group should then define the priority basic information to collect and have this list validated by the highest managers of the ministry. One can start with the list of essential data to collect as proposed in Chapter 4. If the situation requires, it is also possible to rely on one or several surveys to speed up the availability of data.

The construction of questionnaires focused on essential data should then follow. For some data, and in extreme cases, one can carry out sampling surveys on condition that there exists a complete and updated schools sampling base.

Then the questionnaires should be transmitted to the schools (in hard copy/paper or electronic form (diskette or CD-Rom). All actors should be mobilized for this collection in order to obtain a rapid transmission and response from the schools.

It is necessary to relaunch this collection several times in order to speed up the return of information.

At the same time, it is necessary to set up the tools for data capture and processing. Here the question of the level of computerization of the education administration comes up.

To carry out these operations, it is more often necessary to organize specially-designed training for the members of the EMIS's steering committee as well as the most active service personnel in EMIS.

6.3 What should be done with an extremely weak level of computerization and telematics?

The steering committee should consider the setting up of a 'minimal' computerized service as a major priority.

The first phase is to equip the unit in charge of EMIS at the central administration level with microcomputers. The second is to equip the regional services in phases: experiment in some regions first and then equip all regions after that. A third phase concerns the districts or, at a lower level, the schools themselves. Here again, it is necessary to work in phases: some districts or schools first and then all the rest.

The transfer of data should adapt to the development of telematics and the connection of the different administrative levels to the network.

Questionnaires on 'paper' should progressively be replaced by electronic questionnaires, and the mails by transmission via telematics network or Internet/Intranet.

To minimize and speed up the first data returns, it is necessary to limit the collection to essential data by proceeding as indicated in the preceding chapter.

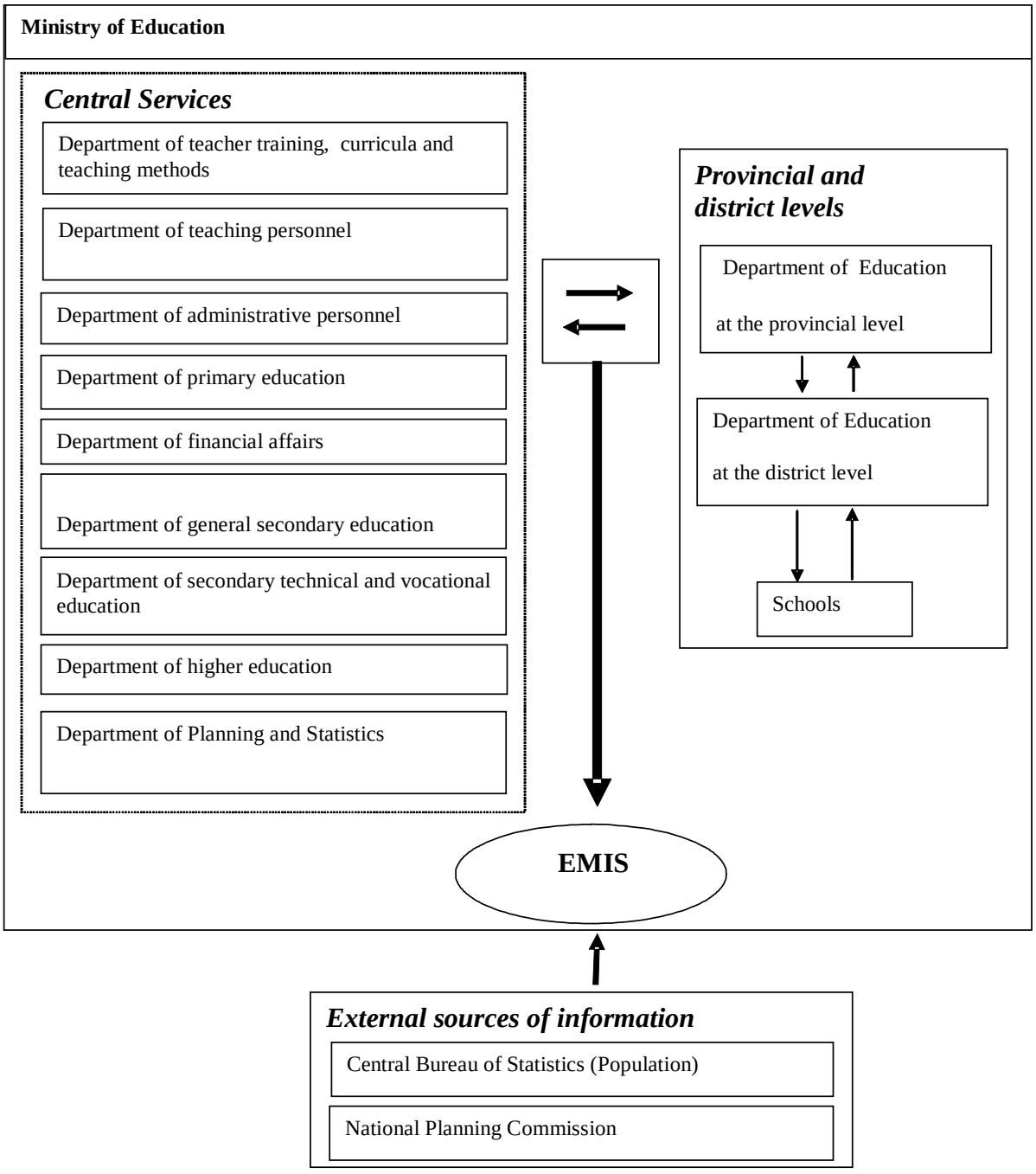
As previously mentioned, all these operations should be accompanied by training for the most active personnel.

6.4 What should be done if an information system and the beginnings of computerization and telematics are already in place

This is a common situation and here we will summarize how to proceed to set up EMIS.

Let us suppose that the organization of the central administration is close to the diagram presented below. This diagram is not a model but it allows for an easier presentation. In a given country, it will be sufficient to adapt the given indications according to the organization proper to this country.

Diagram n° 3: Example of the definition of the field of study of the education information system



As always, the first phase will consist of setting up an EMIS project team directed by a person competent in statistics and education indicators, in information system organization, and in steering projects. This person should be attached to the department in charge of EMIS. In our example, it can be the department of planning and statistics. The team around the project leader should include one or several representatives of each of the directorates producing and using the information which will be processed in EMIS. In our example, one should include the pedagogical departments (primary, general secondary and technical secondary, higher education), the department of teaching and administrative personnel, the department of teacher training, and naturally several persons from the department of planning and statistics.

This team should quickly organize the EMIS project: list of tasks to carry out by order of priority, timetable, and necessary resources. The team should have its project validated by the highest authorities of the ministry/ministries to ensure that they are aware of all the elements: priorities, timetable, and resources.

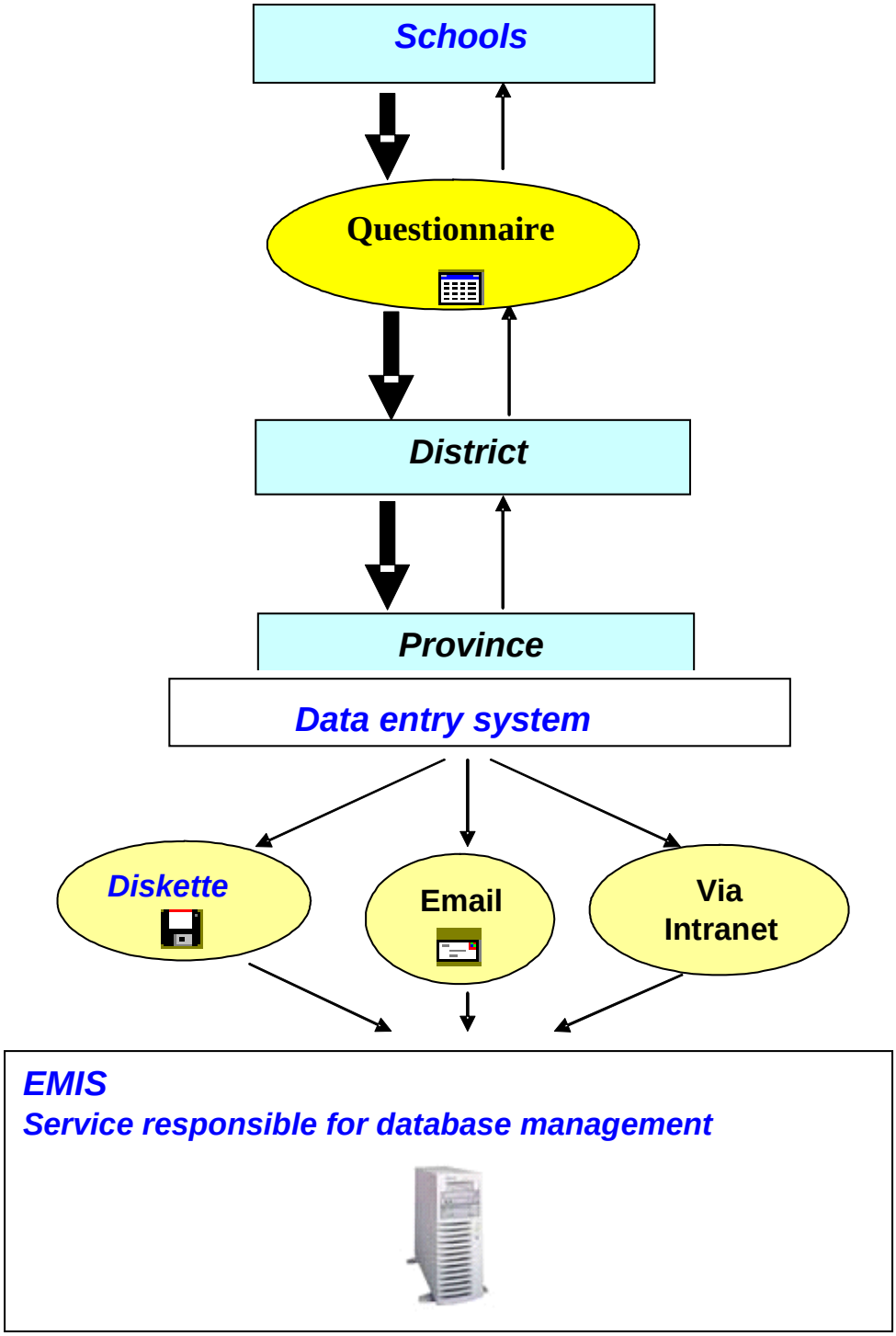
6.4.1 Analysis of the existing situation and the first structuring of EMIS

The first task of the team will be, as always, to conduct an analysis -- assessment of the organization of the ministry/ministries in charge of education in order to identify the management systems producing and using information. Then, the team should conduct a detailed survey of the information managed by each management system. It should also define the precise scope of EMIS: on the levels of education, i.e., primary education - secondary - higher - vocational training - education depending on other ministries like agriculture, health …. The question will be: should all the levels be treated at the same time (the ideal situation) or should one start with only a sub-set?

It is also advisable to define the different fields covered by EMIS: schools, pupils, teachers, administrative personnel, finance, pedagogical materials and equipments, etc…. It is necessary to answer the same question as in the preceding paragraph (as a whole or by sub-sets) and in addition, define at which level the information should be available for each of the fields. For example, the data on pupils should be available down to school level but the financial data should be available only at the national level or eventually at the regional level.

As an example, one can very well consider that it is necessary to start with basic education in all its different aspects: pupils - teachers - finances. One should then make a fine analysis of each of the three fields (Cf. diagram 3).

Diagram n°4. Information sub-system: School
(Proposed procedure for an annual survey)



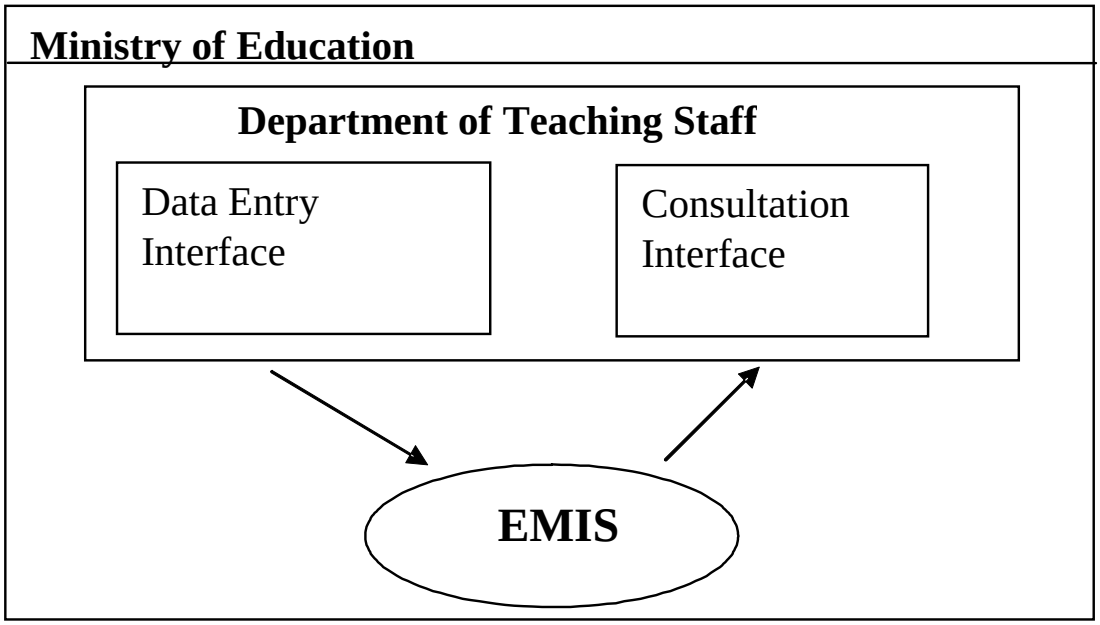
At the same time, the team should identify potential users of the database and proceed to translate their needs into the data to be collected, and set up a

timetable for data collection in order to provide information to each user at the right moment. On this occasion, the team can find out the **necessity** to collect new data. In our example concerning basic education, it will be necessary to involve the department in charge of this level of education, the department of teaching personnel and the directorate of financial affairs.

6.4.2 The training of the EMIS steering committee

The training of the steering committee and the most active personnel is a very important element in the success of the project. The training should be targeted on current or future operations with a strong operational objective. Initially it should include statistical elements, computerization, telematics and project management. They should be a resource throughout the duration of the project, making it possible for the steering committee and its closest collaborators to set up these operations successfully.

Diagram n° 5 Information sub-system: Teaching personnel
Field of study of the application - Management of teaching personnel



6.4.3 Modelling information flows and designing a global operational diagram

From this analysis and decisions concerning the scope and fields of EMIS, the team will have to define a rational organization and management of information.

As a result of the previous analysis, the team should be able to avoid double (triple,…) identical requests for information coming from the administration, organize the coordination between the services concerned, and organize the distribution of tasks. For example, one can choose basic education as a framework.

For the pupils, the information flow diagram will be designed according to information statistics usually coming from the schools, then passing through the department of education district and provincial levels (cf. diagram 4..).

Regarding the data on teaching personnel, it is necessary to refer to the analysis made previously to define the best possible flow of information. In general, the directorate of teaching personnel has individual records for teachers which it must share with the directorate of financial affairs because the latter must ensure the payment of the teachers. The information included in the record comes from local levels in charge of recruitment or of management of different types of personnel. There are actually several managers because, in the majority of countries, several categories of personnel co-exist: teachers with tenure, teachers on temporary contract and replacement teachers for example. It is important therefore to define how the data will be obtained for each of these categories and how the information will circulate between the services. Major coordination is necessary at this level to guarantee exhaustive information and its possible use by all the interested services. Clearly this is a problem linked to the nomenclatures used: it is necessary to ensure their coherence or better still their complete identity. This is followed by the challenge of communicating information between services.

The EMIS team must conduct this coordination, which can lead to the following diagram:

- For all the teachers with tenure, the capture and management of individual data are ensured by the department of teaching personnel on the basis of the nomenclatures developed with the different services and in particular with the department of planning and statistics. The teaching personnel department transmits to all the 'users' (EMIS included) the aggregated data on the teachers with tenure broken down according to the needs expressed by these users. The department of planning will certainly ask for data by age, seniority, status and grade, for example. It will also wish to know the teachers in active teaching and not all the teachers. This is possible if the nomenclatures have been made and used effectively.

- for the temporary teachers, there are many possibilities:

    - they can be managed like the tenure holders: same level of recruitment decision, same management system; in this case, they are treated like the tenure holders;
    - they can be managed differently and in this case it is necessary to organize specific data collection for these personnel. This could be carried out by the directorate of planning for example, which could conduct a survey (simple with grouped data) to know their number and their principal characteristics.

At the end of this analysis, one will have elaborated the conceptual diagram of the data. For each of them, it will be necessary to prepare precise terms and definitions making it possible to establish a reference of information which can easily be transformed in the following phase into what constitutes the heart of the information system: the data dictionary.

This overall analysis should also be done for each management field. In the example of teachers, it will be appropriate to define the flow of information for each category of personnel, the lists of characteristics of these teachers to collect and the related nomenclatures matching the needs of all the users (EMIS included).

The team should then define and organize the data collection and the circulation of information between the different institutions: schools - districts - provinces - central administration. Relying on the immediately available informatics and telematics resources, it will be necessary to determine the way in which the different levels and the different institutions transmit and process the data. In case of a planned transformation of these resources, it is necessary to immediately foresee how this announced transformation could facilitate the exchanges and/or processing. Hence, the setting up of an Intranet between the central administration and the provinces can greatly facilitate the transmission of information between the two levels. The arrival of better-trained personnel and more powerful computers at the provincial level will allow for more complete data processing at this level.

This can successfully lead to different information circulation diagrams according to different sub-systems.

For the pupils, for example, one can design an information circulation diagram as described in diagram n°4.

The information collected by a 'paper' questionnaire leaves the school, arrives at the district that checks, verifies and transmits the data to the province. At the provincial level, the questionnaires are fed into computers and the information transferred onto an electronic support system which can then be sent via the mail or via Internet or Intranet to the central administration.

For teachers with tenure, to continue the example described above, data entry would be conducted by personnel managers (cf. diagram n°5). By contrast, the information on teachers on contracts and replacement teachers would be collected from the questionnaires coming from schools.

The EMIS team should also define at which level the information must reach. For example, the nominative information on pupils of the secondary level don't necessarily need to reach the central administration. But an aggregated information should, in this case. It is then necessary to define it and give oneself the means to produce it: for example, the use of query tools on the database to produce aggregated information.

Different collection documents must be produced. They can be on 'paper', like in the example given, or on an electronic support (diskette, CD-Rom) but must be coherent with the identified method of transmission and the resources available. It should be remembered that they must evolve with the technical possibilities. As soon as the schools are equipped with computers and telematics, the questionnaires can be developed in an electronic format and transmitted by telematics.

In addition to these documents, it is indispensable, as already mentioned, to constitute a group of nomenclatures covering all the data collected. These nomenclatures must be agreed to and shared by all the management and statistics sub-systems. In fact, without a common nomenclature, these sub-systems will be incapable of transmitting information between them. And yet, this is absolutely indispensable. We saw an important illustration with the example of teachers…..

At the end of this phase, several elements will be available:

- a conceptual diagram of general data, and by management sub-systems making it possible to build a conceptual model of data;
- a relational diagram making it possible to 'visualize' how the data are in relation to one another;

- nomenclatures common to all the producers of information (managers and statisticians) allowing for exchanges between the information sub-systems.

6.4.4 Technical phase

Based on these elements, the choices of organization and logical and physical processing of data will need to be made. To put it plainly, it will be necessary to choose the computerized organization that best matches the different elements. It is therefore necessary to create a team responsible for a 'computer' sub-set of EMIS. This team must have a solid knowledge of computers and in particular of database management. Training can improve the initial skills of this team and give it the means to build an efficient computerized system indispensable to EMIS.

The choices that it will make must be coherent and harmonized, facilitating exchanges between the different geographical levels.

One will need to define the type of material retained for computer networks (server and work posts) and the operational system of the servers (Windows, Linux, Unix…) and the workstations (Windows 2000, XP…)

As mentioned previously, if the country is big enough (with more than 1000 schools for example), it is necessary at the central administration level, to organize the data collection by relying on a database management system (DBMS) like Oracle, SQL Server, Interbase…This system should be quickly installed and configured during the data collection period without waiting first for the return of data. If the country is small, it is possible to use Access.

It is indispensable to have competent and trained personnel to manage these tools and to provide them, if necessary, the complementary training they need. Knowledge in specific programming (on languages like C++ or Visual Basic) can also prove very useful.

At the end of this phase, one should have a complete physical model of the data.

The security of the database(s) must be guaranteed: saving the data but also its confidentiality against eventual intrusions (firewalls in case of Internet access for example).

6.4.5 Data processing and the first analyses

It is important to choose a simple computer tool for data entry and control. Here again, the training of personnel is required, however in an urgent situation, it is important to prefer simplicity (by using, for example, the computer programme proposed by UNESCO).

Data processing should simultaneously be accompanied by analyses that can rapidly provide answers to the major changes that the collected data have helped to reveal. Information on the necessary computer tools and conditions for their use (MS Excel, MS Access, Oracle, SAS, SPSS, Idams,….) facilitating these analyses are given in section 4.5.5. These analyses also ensure data reliability and processing.

These efforts should lead to a rapidly prepared document summarizing the first results obtained to be sent to senior managers of the ministry.

6.4.6 Publication of the information

This should be carried out as rapidly as possible in order to provide the services for which EMIS has been set up. The first documents must be transmitted to policy and decision-makers and other pertinent users without delay to show them the system's efficiency and the benefits they can expect from it.

As soon as the computer resources can allow it, the tools for database consultation must be set up. For example, on a database of the Oracle type, tools like Business Object or Seagate Crystal Report, Beyond 20/20… can enable different service users, after some training, to carry out their own queries on the database. This is a very important element in the EMIS development.

At the same time it is necessary to guarantee a more classic publication of information: a statistical yearbook, for example, which can be on 'paper' or on electronic support.

6.5 The construction of the first set of indicators

Immediately after the first return of data, it is important to set up an indicators' project by using the available data as effectively as possible.

With the proposed essential data in Chapter 4, one can already calculate the following:

- concerning the students: the different enrolment and admission rates by gender, age, and by region. One can also calculate the indicators on repetitions and access at the end of the primary, also by gender and by region.
- concerning the teachers: the level of qualification and certification by gender, student/teacher ratio, the age pyramid of the teachers by gender….
- concerning financing: the proportion of budget allocated to education, the proportion of education expenditures in the GDP and the GNP, the proportion of education expenditures incurred by the local community and authorities, and by the private sector, student unit cost in relation to GDP per capita.

This shows that enough substance is already available for publishing the indicators rapidly and hence for using the elements provided in Chapter 5.

This launch will certainly have a beneficial effect on the development of EMIS because all the actors, through the publication of the indicators, will realize all the advantages of full participation for the effective functioning of EMIS.

6.6 Training all the actors of EMIS

After the development phase of the system, it is imperative to set up a major training operation for the personnel who will be concerned by EMIS.

The training have to be differentiated according to the type of personnel because some will be producers and others users of information. Some persons and some services, however, will be both producers and users of information. They should then be trained for the two aspects.

All the personnel of the sub-systems mobilized by EMIS should also be included in the training.

They should concern all the administrative and geographic levels. In order to obtain maximum benefit, one can generally envisage cascade training for trainers and trainees. It will be necessary, for example, to organize the training of trainers at the national level. The latter will be in charge of training the regional teams who will be directly in contact with the schools.

Informatics and telematics should also be part of the training.

This training system should accompany all the technical or technological evolutions of EMIS

6.7 Monitoring the development of EMIS

As soon as one reaches beyond the 'minimal' production stage, it is necessary to construct, step by step, an EMIS that is more complete and better targeted on the objectives of the country. To do this, all the elements of EMIS must be developed: data collection, calculation of indicators, publication and dissemination of information to all the actors, maximum accessibility of information for all the services and managers.

Additionally, since it is very important to position the results obtained in relation to the medium-term objectives, it is often very useful to calculate projections on enrolments and needs for teachers. The former can be made with different hypotheses, and, for example, if one uses trends projection, one will easily realize the situation of the education system in relation to an objective such as: 'universal primary schooling in the year 20XX'.

A needs' analysis for teachers linked to the projection of enrolments will make it possible to anticipate risks of shortage of teachers or serious recruitment difficulties. The complementary 'forecasting' work is therefore very useful to EMIS and deserves to be integrated in it.

7. A tool for setting up an EMIS: presentation of the UNESCO EMIS Builder software

EMIS Builder is a programme that makes it possible to create and maintain your own Education Management Information System (EMIS).

The aim in developing this programme is to enable the construction of an open system that is easily adaptable to the needs of producers and users of information.

The flexibility of the programme allows for its use in a variety of situations in developing countries (Ministries of Education, Bureau of Statistics, administrative units at the regional, local, and school levels).

It can be used at the central or decentralized levels. The method of using the programme is determined by the organization of data collection of the education system. Thus, whether a local network exists or not, EMIS Builder facilitates the integration of data coming from different sources.

EMIS constructed with EMIS Builder will allow you to do the following:

- improve the capacities of data collection, processing, analysis and publication of information in order that planners, administrators and managers of education have reliable and timely data at their disposal;
- create easy to use interfaces for data entry and storage;
- facilitate access to and manipulation of data for the three profile-types of data users: application programmer, database administrator and end users;
- assess and shape the sharing of information in a multi-user environment;
- maintain the coherence of definitions of data with a data and meta-data dictionary.
- exchange information with other systems (spreadsheets, tables, end-user interfaces management systems), that is to say, the importation and exportation of data;

- ensure the independence of data and applications on the logical and physical level;
- provide results in the form of analytical reports or tables for dissemination purposes on different supports: CD Rom, diskette, paper, Internet, etc.

7.1 The EMIS modules

This programme consists of three main modules:

- EMIS Builder: This module allows you to generate your EMIS according to the definitions and parameters which you enter in response to the questions asked in the process of constructing your EMIS;

- EMIS Edit: This module allows you to return to the construction of your EMIS and modify some elements and parameters previously defined in your EMIS;

- EMIS application: This programme manages your own EMIS created with the EMIS Builder.

Basic concepts used by EMIS Builder

In order to facilitate the structuring and the construction of the database in which EMIS will store its information, EMIS Builder uses three main concepts: elements, dimension and attributes. These concepts have a specific meaning in this context.

- **Elements**

An element (subject or entity) of the information system is the representation of a subject endowed with an independent existence and in conformity with the education management system of a given country. Examples of elements of information: students (pupils), teachers, classes, classrooms, etc.

- **Dimension or property**

Each element of EMIS has dimensions. Dimensions make it possible to define a group of data of the same type which helps structure the database support of the information. A dimension is sometimes called an axis. The temporal and spatial dimensions are classic dimensions.

- **Attribute**

Each dimension owns attributes. The years 1997, 1999 for example are attributes of the temporal dimension, year.

Example:

The table below presents two examples of elements, dimensions and attributes according to EMIS Builder.

Element	**Sub-element**	**Dimensions**	**Attributes**
Student		Age	<5 years, 5 years, 6 years, 7 years etc.
		Gender	Male; Female
		Grade	1st, 2nd, 3rd, etc
Buildings	Workshop	Type of construction	Stone, Concrete, Cob, etc
		Condition	Good, average, bad, etc
		Area	M²
	Library	Type of construction	Stone, Concrete, Cob, etc.
		Condition	Good, average, bad, etc.
		Area	M²
	Store	Idem	Idem

Each attribute of an element takes a value from a variety of possible values. One can combine the properties and its attributes of an element to define a cell in which one obtains a value.

In the example of the element pupil, we will have the following grid:

Age	1st grade		2nd grade	
	MF	F	MF	F
< 5 years				
5 years				
6 years	230	120		

The value 120 indicates that there are 120 pupils of feminine gender aged 6 years who are in the first grade. In order to complete this information, we have to introduce other dimensions for the element pupil, the temporal, spatial

dimensions, and the level of education. For example, if it concerns data for the year 2000, for the region X and for the primary level, our information is complete.

7.2 Steps for the creation of an EMIS using EMIS Builder

Configuration of your access to a DBMS

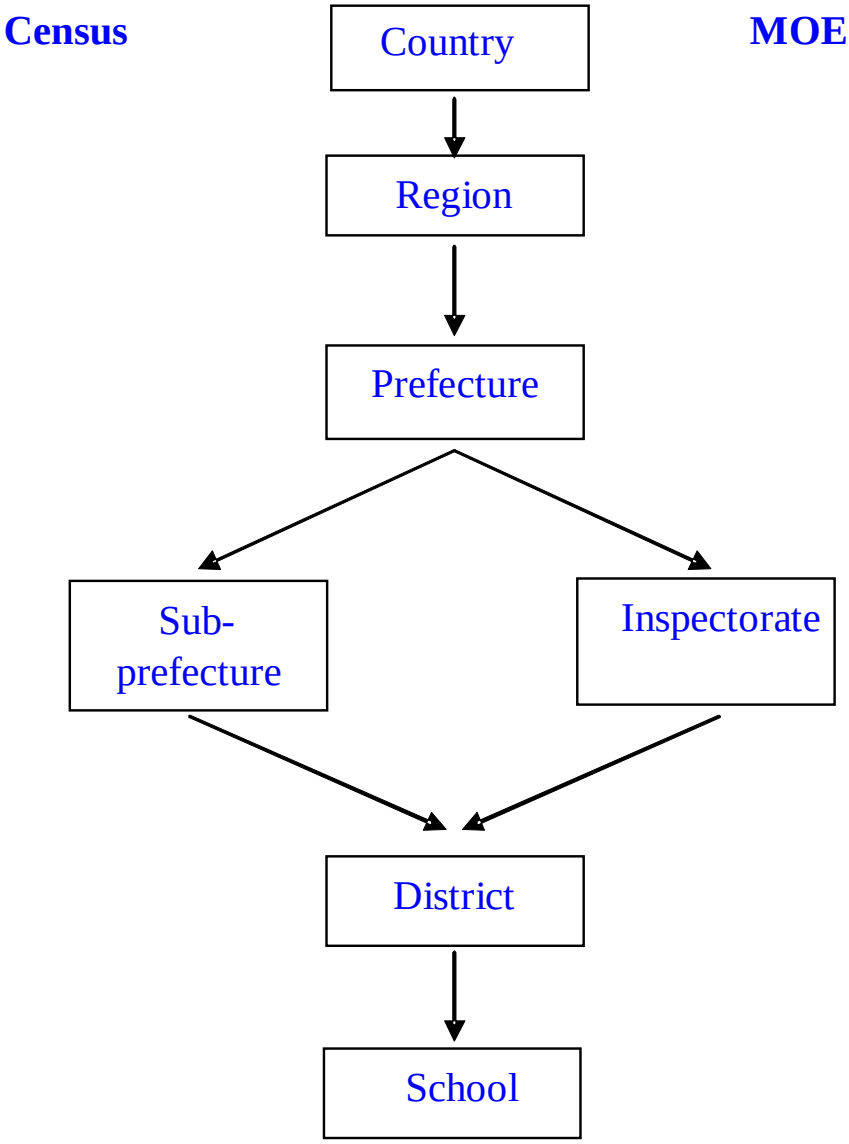
You should indicate to EMIS Builder the database which will serve as the support of your EMIS. EMIS Builder is composed of two main elements: the application itself and a database management system (DBMS). EMIS Builder uses the connection ODBC (Open Database Connectivity) to access the sources of data. ODBC is a standard developed by Microsoft which allows access to a great number of databases from a single application. The ODBC pilots make it possible to be connected to all the database managed by ODBC (Oracle, Sybase SQL Server, MS SQL Server, DB2, etc.)

EMIS Builder adopts a client server architecture with the clients who operate on a Windows platform, and the server on a Windows NT or Windows 2000 server. The distant database servers use SQL to allow clients (your EMIS application) to access data. EMIS Builder can also use a local database stored in your hard disk (Dbase, FoxPro, Access, etc.).

Creation of tables according to the geographical and administrative settings existing in your country

The information contained in these tables allow the entry and analysis of your data according to the spatial dimension chosen. The management of data entry can follow the administrative setting of the ministries of education (MOE) and the presentation of data can use another setting, for example that of the population census to allow for the calculation and analysis of indicators needing the data on population (enrolment ratios for example).

The diagram below presents an example of the coexistence of two administrative settings, that of the census and that of the Ministry of Education. EMIS Builder will allow you, for example, to enter the data according to the setting of MOE and to present the results and analyses according to the setting of the census.



If you have data on the geographical setting in another database or in Excel or in some texts, you can import these data into your EMIS.

Creating tables concerning the information on your education system

In the course of the following phase, you must enter the information related to your entire education system, even if you are concerned with only one education level, because the EMIS approach is sector-wide. This does not mean that you should enter all the information concerning other education levels, but you can easily import data collected by other ministries or administrative units eventually. You should enter the information concerning, in addition to the education level, the cycles and programme orientations in the case of the secondary education (general, technical and vocational). The interface of data entry will allow you to adapt the names of levels to the national names, and enter the duration of study and admission age in every level and cycle. In addition, if there are several education systems (admission age or different durations of study), EMIS Builder offers you the possibility to take account of these differences.

Adding and editing elements

You can add new elements and adapt the fundamental elements to the national terminology. EMIS Builder contains fundamental (core) elements without which EMIS would not be a real information system. These elements as well as the dimensions and attributes cannot be deleted or changed. You can only adapt them to the terminology used in your system.

These elements are:

(Belonging to the education system):

- Identification of schools or universities
- Pupils or students
- Teaching personnel and non-teaching personnel
- Buildings
- Furniture and equipment
- Textbooks and teachers' guides
- School facilities
- Curriculum
- Finance and expenditures of education

(External data):

- Population
- Budget
- GDP

Concerning the information on pupils or students, EMIS Builder allows you to enter aggregated data for each institution (school, junior high school, senior high school or university etc). Concerning the data on personnel (teaching and other personnel) EMIS Builder offers you two possibilities: individual data entry for each teaching personnel or other personnel, and aggregated data entry for each institution. The first option could be used by the Department of Human Resources of your MOE and the second by the Department of Planning, for example.

The 'edit of elements' option allows you to adapt the names of the existing core elements to the national terminology.

Adding and editing dimensions and attributes

Once the elements are added, the user must include the dimensions and attributes of these elements. As for the elements, the dimensions and attributes can be adapted to the national denominations by means of the edit interface.

Your EMIS

Once all the information concerning the geographical or administrative settings, the education system, the elements, the dimensions and the attributes are entered and included in your EMIS, you can move to the next phase: the creation of your EMIS.

You should select the elements of the system to include in your EMIS. For example, you may at the beginning exclude the element "Education expenditures", and may wish to include it later by using the module EMIS Edit.

In the course of this stage, EMIS Builder will create all the interfaces necessary for entering the data that will be available in your EMIS.

7.3 EMIS Application

Once your EMIS is created, EMIS Application will allow you to execute and manage all its component modules. These modules are:

- Data Entry Module:

  Interfaces will be available to you for entering the data concerning the elements that you have retained to form part of your EMIS. The captured data will be stored in the database created by EMIS Builder.
  In addition, you will have interfaces for entering external data like population, budget and the GDP.
  These interfaces will also enable you to read and update the data stored in the database.

- Results module:

  This module allows you to consult the pre-programmed reports, as for example pupils in primary education by grade according to regions, etc. You can also create a new report with the help of the wizard reports creation.
  Finally you have the possibility of directly entering SQL requests from its SQL editor. In this way, you can send queries to your database for specific data.

- Graphic module:

  This module enables you to create graphics that could be integrated into your reports or published separately. This module is composed of the most commonly used types of graphics: bar charts and pie charts, 3D surface, scatter, XY radar, etc.

- Indicators Module:

  This module consists of two options:
  (i) a list of the most commonly used education indicators, among them the indicators necessary for the monitoring and evaluation of the Education for All objectives defined in Dakar, whose list includes 18 basic indicators used for the EFA assessment in 2000.

(ii) a wizard that guide the user through the creation of indicators which enables you to create new specific indicators which do not appear on the previous one.

- Module for the Simulation Model:

  This module allows you to prepare the data in order that the UNESCO simulation model *EPSSim*[33] can use them for the elaboration of education policies and strategies.

- Analysis Module:

  This module makes it possible to create graphs and tables of cross-references to visualize and analyze data according to different perspectives. It is a decision-making tool for the management of the education system.

- Tools Module:

  This module includes some tools such as the *Sprague* multiplier, index calculator, statistics parameters (averages, variance, etc.), trends adjustments, etc.

Conditions required for the installation of EMIS Builder

- Microsoft Windows 95 or higher
- Minimum RAM 32 Mo (128 Mo Recommended)
- Minimum required hard disk capacity 20 Mo
- CD-Rom

[33] *Educational Planning through computer simulation.* 2001, Paris, UNESCO

Conclusion

This document aims to provide some ideas to facilitate the construction of an EMIS and its development. It also intends to show that this construction is attainable, whatever its point of departure, and that it is possible to rapidly produce elements (indicators) indispensable to the monitoring and evaluation of any education system.

The new century, more than ever, will be knowledge-based. Education and training therefore have a major role to play. The importance given to the declaration 'Lifelong Learning' at both country and international organization levels proves this without doubt. To face this challenge, it is essential to construct tools that provide the best possible way to manage, monitor, and evaluate the education system. At the same time, with the introduction of new means of access to knowledge, and new publics linked to this lifelong learning, this education system becomes more and more complex. To construct an efficient EMIS that can respond to all these complexities is not an easy matter, and harder still, to make it evolve to adapt to school changes. But given the importance of what is at stake, there is no other choice. Therefore, to all the present and coming EMIS, our best wishes.

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