Teacher Management

Module 5

Monitoring tools and information systems for teacher management

Teacher's College, Zambia. Credit: GPE/Alexandra Humme

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List of abbreviations

CEDRE	Cycle des évaluations disciplinaires réalisées sur échantillon/*Cycle of subject matter assessments on samples*
DEPP	Direction de l'évaluation, de la prospective, et de la performance /*Department for evaluation, forward studies and performance*
DOM	Départements d'Outre-Mer/*French overseas territories*
EMIS	Education Management Information System
EPP	Emplois, Postes, Personnel/*Jobs, Posts, Personnel*
HRM	Human resources management
ILO	International Labour Organisation
JDC	Journée défense et citoyenneté/*Defence and citizenship day*
LOLF	Loi organique relative aux lois de finance/*Organic law on the finance laws*
MENESR	Ministry of National Education, Tertiary Education & Research
MIES	Mission interministérielle « enseignement scolaire »/*Interministerial "school education" mission*
MoF	Ministry of Finance
OECD	Organisation for economic cooperation and development
PISA	Program for international student assessment
POLCA	Pilotage opérationnel de la LOLF en administration centrale et en académies/*Operational monitoring of the LOLF in central administration and in the académies*
SIMAC	Société Internationale de Management et de Communication (Benin)
TMIS	Teacher Management Information System
TSD	Teacher service department (Lesotho)

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Module 5 - Monitoring tools and information systems for teacher management

The last few decades have seen a rapid expansion of primary and secondary education systems. This development has entailed the mobilisation of considerable resources but at the same time increased the need for more effective teacher management. The latter requires being able to analyse a large amount of data coming from multiple sources and gathered together in teacher management information systems.

These data provide the basic information required by human resource managers for planning (e.g. forecasting staff numbers) or management (e.g. teacher allocation) activities. Adapted planning and monitoring tools as well as techniques are therefore necessary in order to take decisions on teacher policies.

This component of the course will enable participants to become familiar with the key elements of information systems for effective teacher management. It is important to note that whereas the first three modules were entirely focused on secondary teacher management, this module provides information that applies across all education levels.

Part 1 presents a general outline of information systems and their utility in the framework of human resource planning and management activities. It also introduces the basic terminology related to the development of teacher management information systems. **Part 2** explores the approach to, and the different stages involved in the design of teacher management databases. **Part 3** sets out the challenges of information systems as well as possible ways of improvement.

Finally, the information provided in the **Annexes** reviews the notion of indicators, their formulation and interpretation, as well as their presentation in the form of scoreboards. In order to understand the end purpose of information systems, a country example provides information on database structure, the processing of information, its use in scoreboards as well as its dissemination.

Objectives of the module

This module will:

- Enable you to gain a global understanding of the concept of teacher management information systems and their role in the planning and management of human resources;

- Allow you to identify the key characteristics and components of teacher management information systems and associated computerised databases;

- Introduce you to frequently encountered challenges linked to teacher management information systems.

Expected learning outcomes

By the end of Module 5, participants should be able to:

- Understand the importance of information systems to guide decisions related to teacher management (recruitment, career, assignment, etc.);

- Become familiar with key elements to consider when developing a teacher management information system and a database;

- Understand the frequently encountered challenges linked to teacher management information systems.

Questions for reflection

Before reading this module, we suggest that you reflect on the following questions:

- How would you define an information system?

- What are the different stages for information processing?

- How is the information on teachers disseminated in your country?

References and further reading

In addition to this document for Module 5, we strongly recommend that you consult the following documents. They are available on the course's electronic learning platform.

- ILO. 2012. *Handbook of good human resource practices in the teaching profession.* Module 1, section 1.1.2. Geneva: ILO.

- McMahon, W.W. 1993. *An efficiency-based management information system. Fundamentals of educational planning*, n° 49. Paris: IIEP- UNESCO.

- Sauvageot, C. 2003. *Indicators for educational planning: a practical guide. Second edition*. Paris: IIEP- UNESCO.

Part 1. Teacher management information systems

1.1 Utility of information systems for teacher management

Teacher management has long-term consequences for the education system and requires reliable information, knowledge and resources. Whether for diagnosis, policy formulation, projections and simulations, monitoring and evaluation, or any other analytical, management or monitoring activity, information is essential in order to understand a situation and take action. Objective, data based decisions are key to improve the effectiveness, efficiency, and equity of education systems. As such, it is necessary to have information systems that collect, store, process, disseminate, and use data and information targeted at the different management and decision-making authorities.

1.1.1 Practical use for planning

A comprehensive teacher information system enables decision-makers at different administrative levels to make the necessary choices, planners to draw up scenarios for the future and managers to prepare budgets, schedule recruitments, allocate resources within the system and support education sector staff in their career. It must not be limited to purely quantitative and statistical aspects but must also include more qualitative aspects like, for example, teacher appraisal or in-service training.

A reliable and operational information system is fundamental to carry out different human resources planning and development functions such as:

- checking teacher allocation to schools on a regular basis against the number of posts in order to identify surplus/lack of staff;

- preparing annual budgets and financial reports;

- identifying personnel to be promoted;

- developing training plans at national level;

- estimating the number of teachers per category to retire each year;

- estimating the number of teachers to be recruited in future and so the number of candidates to be trained in the training institutions/universities, etc.

When the necessary information for these functions is available, the margin of uncertainty and error in the decision-making process is considerably reduced. *At the same time, the relevance of, and the capacity to mobilise the information depends on the organisational structure, the data collection and integration procedures and management rules in force in the organisation.*

It is crucial to ensure that the information is collected from and disseminated to local administrative levels as the quality of their work largely depends on the effectiveness of these processes. The circulation of information throughout the different sub-systems is indeed necessary for the education system to function properly and can enable local authorities to enhance the quality of the schools in their constituency.

Box 1.1: Importance of information

'Information is often thought of as the life-blood of large-scale, complex organizations, especially those operating in environments characterised by change of all sorts. An organization's capacity to understand, respond and adapt to its changing environment is based both on the available information and the organization's capacity to process that information into viable actions, decisions, policies and plans. Simply put, information is a necessary (but not sufficient) condition for 'intelligent' and responsive organizations capable of adapting to a changing environment.'

Source: Sack and Saïdi, 1997: 44

1.1.2 Informing indicators and their systems

As teacher management functions are becoming increasingly complex, raw data is frequently insufficient to provide the information necessary to effectively conduct them. It is often necessary to link various inputs and outputs of the education system in the form of indicators that provide essential information for educational planning. Well-functioning information systems are crucial for that. They are indeed key to inform different indicators used to monitor the accountability, effectiveness, efficiency and equity of the education system as well as to support decision-making in line with the stated objectives. The information systems also provide the necessary data to operationalize various indicators systems that refer to a higher dimension, because they not only measure the different components of an education system, but also provide information on the relationship between, and the synergy of, those components in the way the education system works.

Nevertheless, it is important to remember that indicators and their systems point out situations of malfunction or of success, but do not provide an explanation, and do not immediately provide an interpretation. In fact, they constitute a tool that gives us information on the functioning of the education system in the framework of educational policy objectives, highlighting its main aspects. In other words, they cannot identify the causes of problems or offer solutions; they help us to better understand the existing situation which can then lead to different improvement measures.

1.1.3 Political dimension of information

It is important to understand that the best possible information and analytical documents based on it will often have little impact if they do not benefit from political support and interest. Political support is a clearly established requirement for the effectiveness of an information system, both for the production and the use of information. Whether for obtaining sufficient human and material resources from the institutional structures to support the training required, or to disseminate statistical documents, it is crucial to obtain this political support.

An information culture can therefore be developed through the will of the public authorities to support the information system in place and its evolution. It also supposes the participation of the different actors concerned in the development of the data system.

1.2 Key areas of human resource management

Information needs that exist in the system will differ for various categories of decision-makers and actors. As a result, the need for information will vary depending on the administrative level (central, regional, etc.) and the type of decision to be made (strategic and planning, management, administrative, supervision, operational, etc.). Information systems contribute to teacher management in three major areas:

1) Administrative management (or personnel management) covering pay, allowances, transfers, etc. This requires detailed information on each teacher, such as date of birth, qualifications, leave, etc. These data are essential for assigning and promoting staff as well as for salary reviews and pension calculations.

2) Collective management, to monitor imbalances in teacher distribution per region, school, gender and qualifications, and to regulate the number of teachers according to supply and demand. It focuses on aggregated data related to administrative divisions. These data make it possible to manage staff surpluses and shortages and enable administration to ensure that schools have the capacity to effectively conduct their activities.

3) Pedagogical management, requiring information such as appraisal reports, number of supervisory visits, etc. This mainly concerns local management whereas collective teacher management deals more with the aggregated data at national or subnational level.

1.3   Concepts linked to information systems

This section aims to clarify the key concepts used in the module, namely the Education Management Information System, Teacher Management Information System, and database.

1.3.1 EMIS &TMIS

At the education system level, we refer to the Education Management Information System (EMIS). However, the Teacher Management Information System (TMIS), which must be an integral part of the EMIS, can be singled out more specifically for human resources. Nevertheless, it is important to note that in many contexts the information on teachers will be collected in the Human Resource Management Information System (HRMIS) that includes teachers and other staff. Other alternative names and structures might be found in specific contexts. However, for the purpose of this module we will refer to the TMIS.

Thus, the TMIS can be defined as *all the methods and procedures of information management for human resources management in the education system; this translates into the collection, storage, processing and dissemination of the information for management, monitoring and information purposes. These methods and procedures entail targeting the information to be collected and setting up the appropriate organisation and tools.*

Box 1.2: Education or teacher management information systems (EMIS-TMIS)

Computer-based Education Management Information Systems allow the systematic collection, organization and analysis of information relating to the management and development of education systems, facilitating planning, monitoring, resource allocation, decision-making and policy formation. They can include and integrate data relating to many aspects of an education system: schools (number, location and material conditions), students (by age, sex, educational level, etc.) and teachers.

Likewise Teacher Management Information Systems (TMIS), which should be integrated within any wider EMIS if it exists, have the potential to assist and enhance the human resource (HR) management and career development of teachers.

TMIS may include data relating to all aspects of the teaching force, from qualifications and employment history to details of appraisals and personal development goals and objectives and can therefore be used to plan recruitment, deployments, transfers and training, as well as for HR administrative functions such as payroll and pensions. Computer-based systems also allow self-service administration of certain HR functions (e.g. applying for study or maternity leave, applying for transfer or promotion) by teachers.

Source: ILO, 2012

1.3.2 What is a database?

Not every collection of data is a database. A database designates a set of structured and homogeneous data, registered in format accessible by users either physically or electronically, for processing or consultation.

While the notion of database generally has an IT connotation and so the idea of an electronic format, it is possible to create a manual database with the data stored on index cards. In practice, it is recommended to combine the two for backup reasons. In the rest of this module, we will be referring to computerised databases.

Box 1.3: Advantages of computerised databases

- From an organisational point of view, a computerised database is an appropriate management tool for organising information. It enables the grouping together, consistently and in a single source, of relevant information usually dispersed in different places. As a result, access to data can be easier and the job more convivial.

- From a processing point of view, computer capacities are immeasurably higher than manual processing. Not only is processing quicker, but it is also more reliable, insofar as human error is eliminated. In addition, storing the information on a computerised medium facilitates its duplication and dissemination on a very much larger scale.

- Finally, one of the benefits to be gained from the automation of some management tasks, including teacher management, is the equitable processing of files; only the regularity of a computer programme can achieve this in an impartial and reliable manner. Indeed, due to the limits inherent to human capacities, it is not possible for people to handle hundreds or even thousands of cases with no risk of error.

1.4 Mobilisation of information

Different types of information must be gathered, individually or collectively, in order to carry out various teacher management functions. This implies collecting different types of data from various actors.

1.4.1 Mobilising data from different actors

Human resource management is a transversal activity involving different actors. In order to carry out their functions, the Personnel or Human Resources department needs to draw on the information provided by different divisions. The latter may be located within the Ministry of Education or in other ministries. The organisational structure of the administrative bodies varies from country to country. Even so, generally speaking, the following actors will be mobilised in order to collect the necessary information for the teacher management information system:

Within the Ministry of Education

- Department for Basic Education (or for Secondary Education) traditionally in charge of distributing the budgetary posts throughout the territory and of teacher recruitment, assignment and transfer procedures;

- Department for Personnel or Human Resources in charge of individual teacher management (personal status, leave, assignments, etc.) and of updating a staff register;

- Planning Department in charge of establishing teacher utilisation norms, recording teacher needs for the coming school year (school mapping) and preparing medium-term projections of teacher needs.

Aside from the Ministry of Education

- Ministry for Civil Service: it determines Civil Service personnel status (all ministries combined), their rights and obligations, pay scales corresponding to levels of academic and professional qualification.

- Ministry of Finance: according to the resources that can be allocated to education, the Ministry of Finance delegates posts to the Ministry of Education and prepares and takes care of pay at central level.

For example, the planning department will provide information on the number of enrolments as well as enrolment projections required for the estimation of teacher needs. On the other hand, the Ministry of Finance, generally in charge of civil servant salaries, will communicate information

regarding pay and budget projections. It is therefore advisable that information be easy to group together and analyse, even if it is dispersed in several departments, and possibly in different ministries.

Table 1.1: Mobilising data for HR management from different actors

HR management areas	Data sources
Administrative management	— Ministry for Civil Service — The Department for Personnel or Human Resources — Ministry of Finance — The Department for Basic Education
Collective management	— The Department for Basic Education — The Planning Department
Pedagogical management	— Local administrators — Central inspectorate — School principal

1.4.2 Mobilising different types of data

In addition to input from different actors, the necessary data for effective teacher management information systems are collected via a variety of methods. They all can be used to gather the information for different teacher management areas: administrative, collective and pedagogical management.

Firstly, there are those used by the Department for Personnel or Human Resources. The latter usually has a database and a file on each teacher, which may, or may not be fully or partially digitised. Additional information can be obtained by way of ad hoc surveys (a headcount of teachers in posts, for example).

Data collected by the Department of Human Resources

- Personnel management databases constitute interesting sources for producing statistical information. The database of the Department of Human Resources will contain all available information on the teacher: personal ID number, surname, first name, gender, address, date of birth, statutory category and rank, seniority in the structure, seniority in the job or in the profession, level of academic and vocational education, subjects taught, the department, division or schools they belong to, etc. This information is essential for allocation, transfer, promotion and salary calculations, and provides, more particularly, the necessary data for pension payments on retirement.

- The teacher's file contains all necessary information to provide a historical record of each teacher's service, such as official documents concerning the date of birth, academic and vocational education, taking up appointment, service interruptions, appraisal reports, any disciplinary measures, etc.

- Specific statistical surveys for exploring a specific aspect in more depth. These operations are technically similar to school censuses but cannot be carried out on an annual basis. Such a survey can concern personnel absenteeism, for example.

Other data collection methods and sources of information

- School censuses carried out annually (Planning Department). Questionnaires are sent to the head teachers who must fill them in and send them back to the department in charge of statistics. This kind of technique is particularly well adapted for collecting information known by the head teachers: schools, pupils and students, buildings and facilities, personnel.

- Sample surveys particularly adapted for assessing pupils' achievements (tests) compared to teacher profile, but also for studying the opinions or expectations of parents or of teachers. The fact of using a sampling procedure reduces the costs of administering a questionnaire to the total population concerned. The sample must be representative.

- Laws and decrees in force: information on Civil Service regulations, decrees, indexing scales, etc. (Ministry for Civil Service).

- Financial statements: for example, data related to the teachers' payroll communicated by the Ministry of Finance.

1.4.3 A global approach to the information system

We have seen the wide variety of information useful in monitoring, planning and managing human resources in the education sector. We have also seen the variety of technical responses possible for collecting this information: school censuses, specific statistical surveys, sample surveys, use of management databases, etc. A teacher management information system groups together information obtained through many different channels. As a result, the unity of the information system stems from its overall design and the synthesis of information intended for publication or for the calculation of indicators. *Figure* 1.1 shows how all different elements should be linked to form a coherent information system.

Figure 11: Organisation of the information system

| Context | Policy formulation Monitoring | Education system management |

| Needs analysis | Types of information desired |

| Operationalisation | School censuses | Specific surveys | Sample surveys | New computer application | Existing data-bases | Specific data topics | External data |

| Data format & collection | Questionnaire | Questionnaire | Questionnaire | Software nomenclature | | Special processing | To be collected from partners |

| Creation of databases | Database | Database | Database | Database | Database | Database |

| Structuring of information | Indicators, tables, graphs, comments |

| Communication | Publications | Website/CD-ROMs | Response to requests | Studies |

Source: IIEP, 2014

1.5   The different steps of information processing

Figure 1.2 summarises the different stages involved in processing the information, from identifying the data to be collected to its publication and dissemination. The different phases are briefly presented below (adapted from IIEP, 2014).

1. The identification of needs stage implies the existence of a precise definition of the education system needs in terms of information and a clear model of the operation of the education system. Knowing how the system works helps in defining the fields to be covered, the actors concerned and so the information to be produced according to the system's objectives. Operating models provide a reference framework for the elaboration of statistics and indicators, thus avoiding an uncontrolled accumulation of the latter. A model that presents the different sub-systems and their links enables a more rigorous and appropriate choice of information.

2. Inventory of information sources implies exploring the existing data as well as its sources and verifying whether they correspond to the current information needs. It is a crucial step to make sure that the best use is made of the data that is readily available to avoid its 'wastage'.

    It is also at this stage that the information collection tools (e.g. questionnaires) are designed for the missing data. These tools need to be created in the way to provide the relevant information that would correspond to the identified needs. It is indeed important to select and/or combine data-collection approaches according to the objectives. It is also key to ensure the reliability of the newly collected information.

Moreover, it is essential to consider the data-processing stage at this time. If not all data are used, the data-collection instrument will have been unnecessarily time-consuming and expensive. Time is well spent in the careful reflection on the data-collection needs and their subsequent processing. Likewise, database construction and management must be mapped out before the data are actually gathered. The processing by the database and the presentation of results must be determined as far as possible prior to data collection.
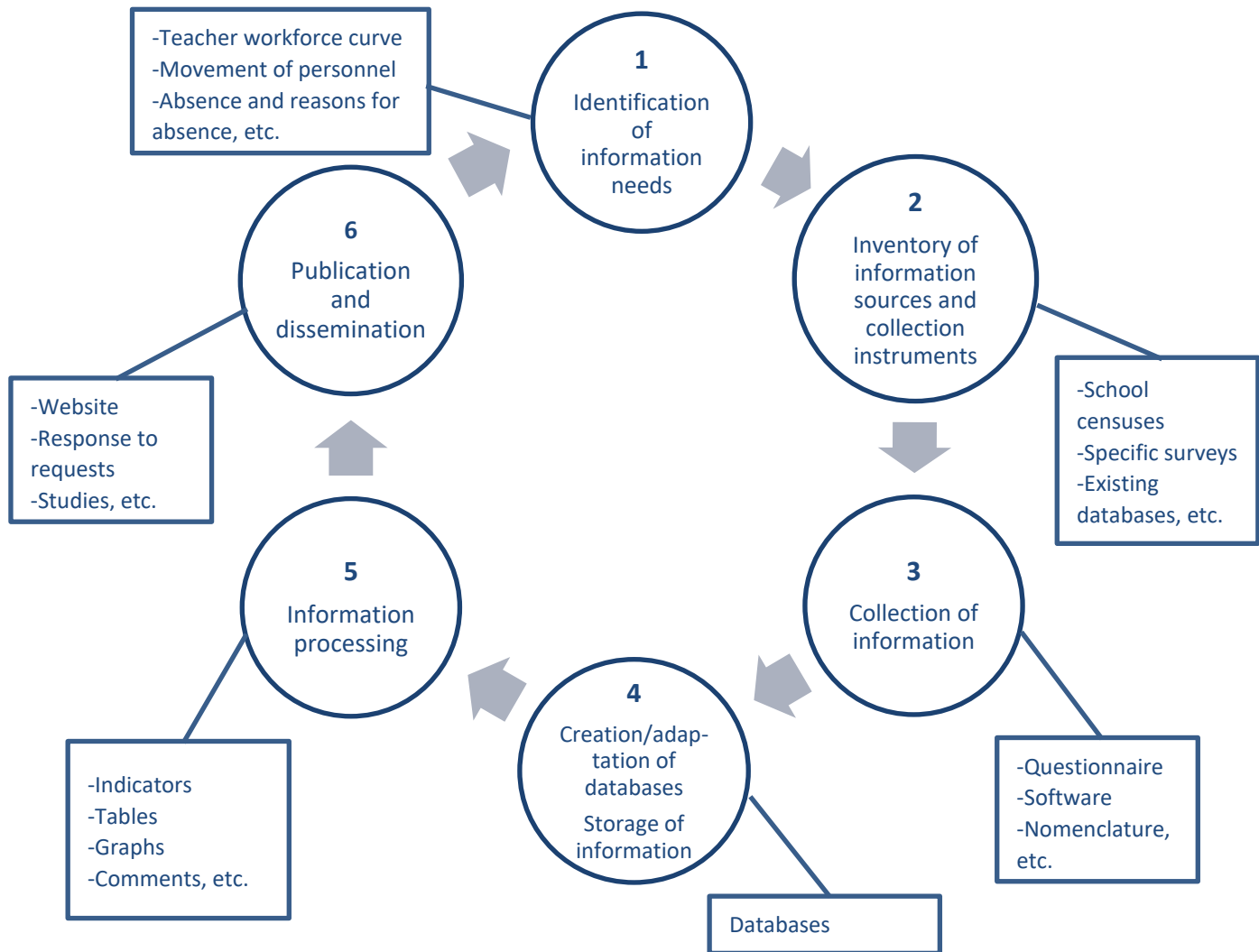
3. Collection of information - once the collection instruments have been prepared (e.g. surveys), the next step is to collect information.

   To collect data in surveys covering large numbers of people, strict procedures must be established. Questionnaires may pass through the regional and local branches of the education administration, which then check the returns for completeness and the quality of the information provided. The data collected are then stored in computerised databases for later statistical processing.

4. Creation/adaptation of databases & storage of information - Storing information in databases requires two types of operation: a) defining the structure of the database and b) entering the data (generally collected in the form of questionnaires or other sources).

   a) The structure of the database depends on the complexity of the field covered by the statistical operation: it may be either a simple file or a relational database. The structure also depends on the software used. For the moment, we note that the structure of the database will be determined by the links among the various types of information. Here again, it is important to remember that the definition of the structure of the database has to be considered early in the process (just after the Step 1).

   b) The data entry stage, in which the database is constituted, is accompanied by a data control process in order to verify the quality of the information entered. This process checks on the completeness of responses and verifies that all the information is present, relevant and consistent with the other data entered.

5. Information processing consists of consulting information from defined criteria, carrying out simulations or forecasts and criteria-based teacher selection, designing graphs and tables, etc. Beyond the production of raw statistical data, there seems to be a growing interest for indicators and series of indicators used for monitoring and evaluation. The indicators, especially when presented in the form of indicator scoreboards summarising current reality and past trends, can enable a clear vision of the state of the system and its evolution over time. The choice of indicators, and their presentation and analysis in specific documents, can contribute to enhancing decision-making, planning and management of human resources.

6. Publication and dissemination modes should be selected to best suit to the type of information concerned and the customers for whom it is intended. Various types of media may be used for communication, although publications or dissemination through Web sites are still the most frequently used.

Figure 1.2: From the identification of needs to the production of results


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-Teacher workforce curve
-Movement of personnel
-Absence and reasons for
 absence, etc.
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1 Identification of information needs

6 Publication and dissemination

2 Inventory of information sources and collection instruments

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-School
 censuses
-Specific surveys
-Existing
 databases, etc.
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-Website
-Response to
 requests
-Studies, etc.
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5 Information processing

3 Collection of information

4 Creation/adaptation of databases — Storage of information

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-Indicators
-Tables
-Graphs
-Comments, etc.
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Databases

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-Questionnaire
-Software
-Nomenclature,
 etc.
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Source: adapted from IIEP, 2014

⊞ Highlights

- An organisation can gain an understanding of its changing environment from the information available and so transform that information into viable actions, decisions, policies and plans.

- An information system is a set of information management methods and procedures, which translates into the collection, storage, processing and dissemination of information.

- In order to be effective, Human Resources managers must be able to rely on information systems that are reliable and operational in three major areas: administrative management, collective management and pedagogical management.

- Different types of information must be gathered, individually or collectively, in order to carry out various teacher management functions. This implies collecting different types of data from various actors and using various data collection methods.

- Information processing follows different steps: i) identification of information needs, ii) inventory of sources of information and collection tools, iii) data collection, iv) creation/adaptation of databases and storage of information, v) information processing, and vi) publication and dissemination.

Part 2. Teacher management databases

As it has been noted earlier, a computerized database, if it is well designed and effectively implemented, has a number of advantages for storing and processing the information. The aim of this section is therefore to introduce some key aspects to consider before designing a database as well as to provide you with more practical elements of how to actually proceed with its design.

2.1   Need for an integrated approach

Before going into practical elements linked to the creation of a database, it is important to note that the creation of a teacher management information system needs to follow an integrated approach for two main reasons: the diversity of human resource management activities on the one hand and the wide range of sources of information on the other. In practice, the diversity of management tasks often leads to a progressive implementation of the information system and multiple databases, as a successive process. If an integrated approach were adopted from the design stage of the system, this would save both time and resources and make the shared data in the information system more consistent and relevant.

Once the information system design framework has been established, the databases can be developed step by step starting with priority needs: payroll management, scoreboards, human resource development and utilisation statistics, personnel movement register, etc.

An integrated approach will serve to populate different education system monitoring databases, especially the database for the production of human resource management scoreboards. If personnel-related data are updated at the start of each school year or in the weeks that follow, and data is reliable and exhaustive, the planning departments (statistical offices) no longer need to collect them in their annual survey. This 'personnel' database will provide the statistical offices with their information needs. This will also be the case for the other users of 'personnel' data: education department, financial department, etc.

Moreover, when organised as a network, integrated databases offer the advantage of information accessible in real time and rapid data processing with no risk of error. In addition, for collective management operations, the processing of information is equitable and impartial, since the computer processing logic is the same for all.

2.2   The use of common concepts and nomenclature

In order to ensure the unity of the information system and various databases it contains, some basic rules must be followed for each of its components:

- Common concepts and nomenclature,
- Common identification of administrative entities.

The use of common concepts and nomenclature is essential for the consistency of information collected in the different databases of the information system.

All the common variables used in the different statistical operations or management applications must be assigned the same nomenclature. For example, teachers can belong to different statutory categories defined by regulations. The different data collection operations, whether school censuses, specific surveys or management databases, must use identical or harmonised statutory category nomenclature.

The use of a common identification for the administrative entities enables interconnection of information from different components of the information system. Thus, assigning an *identification code, which is unique* for each school and for each teacher, to be used in all statistical and management applications, enables the databases to communicate with each other and to cross-reference information from the different collection operations.

It is indeed important to clearly understand how databases (and the files or 'tables' within them) are structured and how they can be linked to each other. Table 2.1 provides an example of two separate databases. The level of analysis is different in each of them. The first one gathers various pieces of information on given schools whereas the second one collected data on teachers. You can see that in Database 1 each school is assigned a unique code whereas in Database 2 each teacher has a code. These codes are called the primary key. It uniquely identifies each record in the table making sure that no other record has the same code.

These codes and classification schemes are extremely important to the information system, as they are the components that ensure its overall consistency. Using the same code for all databases makes it possible to relate data from different sources as it is demonstrated in the example below. Due to the primary key it is possible to associate the information provided on teachers (Database 2) with the information on their schools (Database 1).

Table 2.1: Example of databases and links between them

Database 1: File on schools

School code 🔑	Name	Creation	Status
102030	Clearwater School of Fine Arts	1948	Government
103040	Timber Creek High School	1975	Private
122232	Northview Secondary School	1981	Community
142434	Golden Oak School for Boys	1963	Government
152535	Deer River Conservatory	1958	Government
162636	Da Vinci School for Girls	1961	Private
…			

Database 2: File on teachers

Teacher code 🔑	School code	Name	Date of birth
22569	102030	Shakespeare	1948
22570	102030	Voltaire	1975
22571	122232	Cervantes	1981
22572	152535	Picasso	1963
22573	152535	Van Gogh	1961
22574	102565	Lao-Tseu	1981
…			
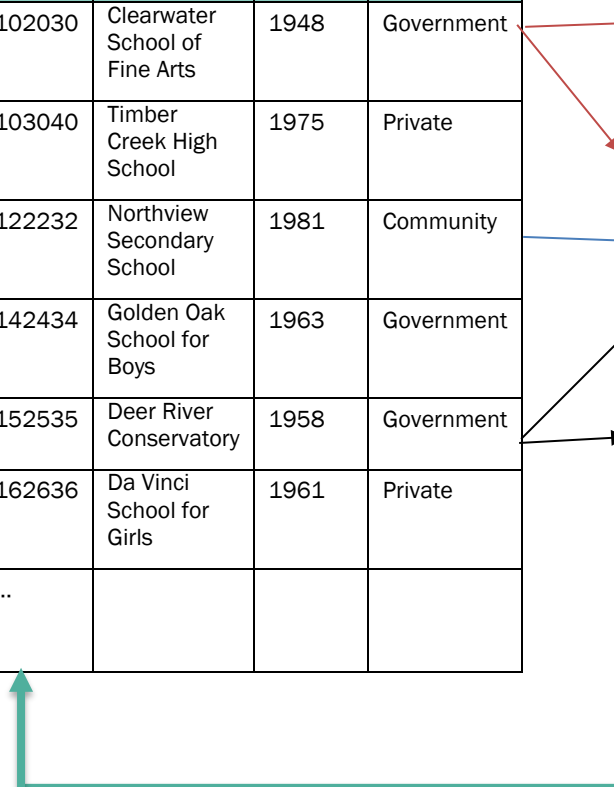
Box 2.1: Designing a teacher identification code

In the case of a teacher management database, each record concerns an individual teacher. To avoid any confusion between records, a number, or personal ID number, is assigned to each teacher, in order to identify the teacher individually. This is called a *teacher identification code.* This is a compulsory database notion. Not only does it enable to differentiate each entity, but it also enables cross-referencing of information between different databases. *Neither the surname nor the first name, nor even the date of birth, should be used for the code since they are not unique. However, these can be combined in order to obtain a unique teacher code.*

A teacher identification code must be assigned to each teacher. While most personnel departments do assign a unique teacher code to each teacher, it is important to think of how to create this code in order to enable cross-referencing of information. There are several systems:

1. A series of figures can be assigned at national level, taking 126543 as an example, the next teacher would have 126544, etc. However, teachers express their difficulty in remembering these figures.

2. The number could be in two parts, the first part indicating the year of the first teaching appointment and the second the series of figures seen previously, for example 81/6543.

3. An « intelligent » number can be created from the teacher's personal information, for example:

    RAMAT/MJ/25.07.65

This number includes the first five letters of the teacher's name followed by the initials of the first name and the date of birth.

4. In some contexts, to simplify matters, the number found on one's national identify card is used.

Source: Adapted from Halliday, 1995

2.3 Going about it

The setting up of a single database for human resource management to be shared by the different users is the work of a specialist. It is not a simple undertaking. Firstly, it would be advisable for it to be part of a *computerisation master plan* for the educational administration and management services. The first step is to clarify and identify the utilisation needs of the database, the database medium, the administrative levels of use and the modalities of training of *IT correspondents* and database users. In other words, the question will be five-fold: *why? how? where? who? and when?*

The answer to these questions cannot be dissociated, since they all contribute to defining the structure of the database and are part of the process described in Figure 1.1. Answering these questions will lead you to formalise a functional and organic analysis before embarking on a teacher management database project.

- A functional analysis then can be very helpful to clearly set the needs for different types of data. It consists of analysing what exists, identifying the needs and imagining a computerised organisation of the data to address those needs. Based on the documents used, their circulation and the data contained therein, each data item is subject to the same questions: *why, how, where, by whom and when is the data item used?* Functional analysis can lead to detecting superfluous operations and documents to be deleted, and procedures to be modified. It can also lead to a reorganisation of management services. Functional analysis therefore defines, in organisational terms:

- data collection modalities (questionnaires);

- modalities and administrative level for the entry of basic individual data and specific collective management data (for example: movement of members of personnel whose requests are to generate the creation of a specific file);

- schedule of the different file updates and of processing for collective management operations.

- Organic analysis refers to the IT design of the database and is also an important step which builds and organises the different components of the database: files, processing, documents to be edited, and files to be constituted for some collective management operations.

Why?

While it is obvious that a database aims to address a certain number of needs, it is worth asking 'why'. This enables forward thinking on the different possible types of data utilisation, and can avoid costly updates in time and human resources at a later date, as sometimes happens when a database is designed too hastily.

The answer to this question will enable the identification of the data necessary for individual, collective and pedagogical teacher management. Asking 'why' also helps to anticipate a whole series of statistical processing operations to be carried out with a view to teacher management.

This proactive approach is necessary in order to identify all the data that could possibly be of use in the database. If any data is missing from the database, this can have major consequences, since it will be impossible to process anything involving these data. Thus, large-scale systematic in-service training programmes for teaching staff cannot be organised using a database if the said database does not contain elementary information on in-service training or other characteristics of serving teachers to guide the selection of beneficiaries for the planned training sessions.

How?

Asking 'how' refers more particularly to the medium of the *database*: manual or electronic? It is clear that an electronic database is more efficient as long as it has been well designed. There again, the limited resources in many developing countries, particularly in terms of IT resources, very often lead to setting up a dual information system, which is partly manual and partly electronic.

The manual information system is generally made up of a series of data in the form of statistical tables, index cards and lists of information, often per name. They are used in schools, inspectorates and sometimes at regional level. They generally include data from questionnaires, or the questionnaires themselves.

The information system in its electronic form is generally used at central, and sometimes at regional or sub-regional, level depending on the education system's resources. Such a database results from the compilation and aggregation of the different manual databases. For example, a database at central level for the management of personnel assignments and movement generally incorporates data from the lists of vacant posts established at regional level, transfer requests filled out by serving teachers and initial assignment requests filled out by teacher training institution graduates.

Where?

Asking 'where' the databases are located, enables identification of the different management tasks they should serve and of the different teacher-related information collection and processing structures or procedures, with a view to ensuring their coordination and harmonisation and to limiting unnecessary duplication.

As necessary, a standardisation or a coordination of data collection between the different existing departments can be envisaged as a solution for consistency of information and optimal use of resources.

Whatever the level of decentralisation or devolution of personnel management, it is essential to ensure:

- use of a single database with the creation of a reference file accessible to all managers and used in all applications; this avoids duplication of information and inconsistencies.
- decentralisation of part of the management with delegation of authority and decentralisation of management tools to enable updating of individual data as near as possible to schools and with some collective management operations to be carried out at sub-regional and regional educational structure levels.

This single database must be shared among all users at all levels of education administration. Ideally, all users should be connected in real time networks to the database in order to carry out authorised operations, such as:

- consultation only, or electronic queries, for study, forecasting or simulation purposes without the possibility of updating the databases;
- updating of personal data such as marital status, diplomas and vocational training;
- assignment, career progression and promotion updates following on from collective management operations.

Table 2.2 below summarizes key aspects to consider when using a database at central and decentralised levels.

Table 2.2: Database use at central and decentralised levels

Decision	Action	Issue	Example of use
Use of a single database	Create a reference file	Avoid duplication of information and inconsistencies	Consultation only or electronic queries for study, forecasting or simulation purposes; database updating not possible
	Allow access to all managers and usage with all applications	Operations in real time through a network	
Partial decentralisation of management	Delegation of authority and decentralisation of management tools	Update of individual data as near as possible to schools	Updating of personal data such as marital status, diplomas, vocational training
		Some collective management actions to be carried out at sub regional and regional educational structure levels	Updating of assignment, career progression and promotion following on from collective management operations

Who?

The database must be designed along with the management and all potential users of the database in order for it to totally address their needs and prepare them for a change in the way they conduct their activities.

The appropriate ministerial authorities must draw up the *specifications*, in consultation with the future database users. This is further to the discussions of an *ad hoc* working group, possibly advised by an information system developer. Asking 'who is going to ensure the smooth implementation of the new database' is equally important. In addition, future database users also have to be prepared to use it.

The Training of 'IT correspondents' is done at all the administrative levels of education concerned with the implementation of the database. The IT correspondents, trained in the database management system, must be capable of debugging a system crash, implementing system or data processing programme modifications and ensuring permanent user training.

It is difficult to train administrative staff in the above mission if they have no computer knowledge. The best solution, although costly, would be to hire local IT professionals since it is not possible to envisage the idea of IT professionals at central level constantly travelling to the different regions to provide assistance to personnel in the decentralised education structures.

Training of database users concerns both general application-related training and specific user-adapted training: using the data input screens, editing documents, consulting data, preparing different types of queries, processing data or creating specific files for collective management operations.

Specific training for staff to become operational in the tasks to be carried out is fundamental. General training must include knowledge of the design logic of the database: computerisation is not a magical operation and users must have a good comprehension of its logic, which is accessible to all.

So-called 'user' documents must be drawn up before any training operation. The documents will serve as a permanent guide to users, especially for dealing with 'error messages'.

When?

The question of when is critical to know at what time the data should be entered or updated in the database to allow time for its processing, use, and its dissemination over the course of the year. Some information will need to be regularly updated for monthly decision-making. Other types of information may need to be updated only once a year. A schedule must be shared among the different users and adhered to.

2.4 Operating process

The operating process refers to the conditions that enable the database to be operational for management and monitoring activities. Amongst these, the administrative data feedback procedures and the data processing capacities should be highlighted.

This generally involves:

- Having adequate human and material resources for:
  - o entry and control of data;
  - o preparation of statistical synthesis documents intended to allow deciders to make decisions based on established facts.
- Developing focused questionnaires, sufficiently understandable and easy to complete so as to minimise the risk of error;

- Ensuring compliance with the timetable throughout the information collection and processing process;

- Carrying out regular data updates;

- Making the data from the base available to all concerned;

- Consulting one's peers for a change in procedures or information

Highlights

- A database is a set of structured homogeneous data, registered on physical media, accessible electronically by users, for processing or consultation purposes. The computerised database represents a number of advantages on several points:

  - It groups together information in a consistent manner and in a single source;

  - It facilitates duplication and dissemination on a wide scale;

  - It enables the equitable processing of files.

- In order to ensure the unity of the information system and various databases it contains, common concepts and nomenclature as well as common identification must be followed for each of its component. In teacher management databases, a teacher code is assigned to each teacher, enabling the differentiation of each entity and the cross-referencing of information between databases.

- The implementation of a database is part of a computerisation master plan and its design requires a number of steps. Before embarking on a teacher management database project, the first step is to clarify and identify the utilisation needs of the database, the database medium, the administrative levels of use and the modalities of training of 'IT correspondents' and database users. Integrated databases organised in a network facilitate access in real time to the information and enable rapid data processing with lower risk of error.

- Good management of a TMIS calls for coordination and harmonisation in order to limit duplication and avoid typical problems (over-centralisation, poor capacities of personnel, timeframes and delays).

Part 3. Challenges of teacher management information systems and possible improvements

With the advent of computerised databases, countries have made considerable progress in establishing teacher management information systems. However, several problems persist, affecting administrative, collective and pedagogical management.

3.1 Challenges

Given the limited resources of many countries, a computerised database of individual data may prove difficult to set up since it supposes regular follow up (constant updating) of trained personnel and an effective organisation enabling, in the case of centralised systems, data feedback at every change in the teacher's situation. In some countries, inadequate information on teachers has been a major cause of malfunctioning, with repercussions not only on the effectiveness of administration, teacher satisfaction and professional commitment, but also on the very quality of education as a whole:

- presence of ghost teachers on the payroll;

- mismatch between posts and teacher profiles;

- absence of global information on teachers' skills, geographical distribution, etc.

Many teacher management problems are linked to the challenges faced by the ministries of education in implementing the information systems. For example:

- incomplete, unreliable data due to lack of regular updates on account of difficulties in accessing personnel files or updating existing electronic files, and to the dispersal of staff over vast territories, where some rural areas are hard to reach;

- delays in data collection, transmission and processing (in manual or computerised management), which generate slow completion of tasks and make controls even more difficult;

- multiplicity of databases with creation and maintenance of several bases containing data of an identical nature (Civil Service file, Ministry of Finance file and different Ministry of Education files) and an absence of liaison between the different files resulting in multiple entries for the same item of information, with increased risk of divergence;

- lack of qualified personnel and of exploitation of the available information for reacting to shortcomings.

3.1.1 Incomplete data

Difficulties due to incomplete information are common. Teacher managers and planners are sometimes faced with considerable difficulties because existing information does not indicate the number of teachers in posts, how many hours they work and where. This situation reduces the capacity of ministries for efficient teacher distribution and utilisation.

One of the problems related to the lack of information on the number of teachers in the system and their assignment concerns the hiring of contract teachers, and even more so the recruitment of community or temporary teachers. This problem often raises additional challenges. Countries like Benin and Niger, for example, where the number of temporary teachers has increased very rapidly since the beginning of the 21st century, have experienced great difficulty in keeping track of these new teachers. In many cases, the increase in the number of temporary teachers has resulted in encouraging the introduction of an information system that covers all categories of

personnel[1]. However, updating a comprehensive and reliable non-civil servant teacher database has not been an easy task, mainly due to a high attrition rate, fluctuations and changes of status (community teachers who become contract teachers or contract teachers who become civil-service teachers after a few years).

The difficulty of access to information on teachers has serious repercussions on planning and budgeting. In Lesotho, at end 2009, the person in charge of secondary education explained that the data for 2007 and 2008 were not available (nor for 2009) which made it difficult to implement the national plan for education. Local councillors did not know the number of secondary school teachers (Mariti, 2010: 40-41)[2].

3.1.2 Delays in collection and processing

In many countries, there are frequently considerable delays in data collection, transmission and processing. When the monitoring and processing of teacher data concerns several levels (district/regional offices, ministry departments), the updating of teacher data can be delayed. This raises problems not only for teachers (in terms of adjustment of specific allowances, issuance of certificates), but also for planners and managers who cannot know, at a given time, if teachers assigned to a school have been able to take up their post, if posts have been freed up or are to be freed up due to retirements or transfers, etc. (Dhersigny, 1999; Tazi, 2005).

3.1.3 Multiplicity of databases and absence of liaison

This question is fundamental insofar as it is not unusual to find, within the Ministry of Education and elsewhere (Ministry of Finance), several parallel information systems comprising data from different sources. This results in a multiplicity of sometimes very divergent statistics. By way of example, data in the central file concerning the number and distribution of teachers are often seen to differ from those in the payroll file. The multiplicity of databases becomes extremely problematic when different school or teacher codes are used for each database, making it impossible to cross-reference or merge information. In fact, from one database to another, "units of account" and ways of obtaining information can vary significantly, making cross-referencing difficult and leading to a distorted vision of reality.

The absence of a common database at Ministry of Education level for the Department for Basic Education (or Secondary Education), the Department for Personnel (or Human Resources) and the Planning Department defies all logic for effective personnel management. Due to the absence of coordination between the three departments, data lack consistency and the updating of three different (manual or electronic) files is very costly in material and human resources.

Box 3.1: Examples of problems encountered in Teacher Management Information Systems

> In Lesotho, "Three databases exist where information on teachers is available: 1) the Teacher Service Department (TSD) database; 2) the Ministry of Finance (MoF) payroll database; and 3) the Education Management Information System (EMIS) database. However, these databases are unreliable and do not communicate with each other, leading to duplication of efforts. According to the CEO of TSD, at the moment 'both (MOF database and TSD database) are unreliable … We need to cut errors down to 10%. At the moment it is high. I cannot say how many cheques we are paying to teachers who are not teaching … We have problems of teacher payment, even after a year.'"
> Source: Mariti, 2010: 40-41.

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[1] In 2000, the authorities in Benin decided to establish a special database and a management unit for contract teachers within the Department for Human Resources. In addition, detailed community teacher recruitment and census procedures were adopted in 2003. However, their implementation was hampered due to under-staffed and under-equipped HRM divisions, and the lack of staff qualified in computer technology, statistical analyses and teacher management (Johnson, 2006).

[2] This was negatively impacted at the time when the elected authorities were negotiating for subsidies with the Fast Track Initiative but did not have information on the number of teachers (author's note).

3.1.4 Lack of qualified personnel

Part of the problem stems from personnel lacking the capacity to carry out their functions properly. This is all the more difficult when data collection and processing are delegated to the district offices, which lack the necessary human resources to enter the information in the required delays and the necessary qualifications to manage the database files correctly. When the regional directorates have computers that can be used to enter statistical data or carry out individual teacher management, this represents a considerable advantage. However, without adequate human resources, who are sufficiently well-trained, the effectiveness of computerisation is limited.

In fact, problems of organisation in managing the information systems are not only connected to the databases but also to the different actors who intervene in consolidation between data collection and data analysis. The same lack of capacity can also be found at central level.

At central level, another problem is the temptation for some countries to install programmes with complicated technology and networks financed by external projects but for which there is a lack of experts in the country for their upkeep and repair when technical problems occur.

3.2 Framework for analysing challenges and possible improvements

In many countries, the malfunctioning of Education Management Information Systems (EMIS) can be detected at three levels: at data content level (relevance, comprehensiveness or abundance of data), at organisational level (administrative rules and procedures, responsibilities and capacity) and at technological level (hardware and software).

An example of Benin could be illustrative to present a possible framework for analysing these challenges. Within the framework of the Fast-Track Initiative programme for the development of an Education Management Information System (EMIS) master plan in Benin for the period 2012-2015, a study relates the main challenges encountered by information system users (see table below).

Table 3.1: Difficulties encountered by the Ministry of Education in Benin in managing the EMIS

Level	Problems
Data content	▪ Statistical data do not reflect a true, reliable picture of the education system; ▪ Human resource, financial and material management is limited to the accounting aspect and so does not offer elements to monitor and evaluate performance.
Organisational	▪ The absence of semantic and organisational frameworks makes data exchange difficult; ▪ There is a high level of duplication across structures, causing a dispersal of information; ▪ The notion of information resource sharing is very limited, resulting in malfunctioning of procedures; ▪ Computer specialists are in very short supply and are scattered throughout the different structures; ▪ Absence of a strategy for computerisation and governance structure;
Technological	▪ Structures are poorly equipped and technical assistance is weak; ▪ Blatant absence of computer applications. Usage is limited to office applications; ▪ Communication infrastructure is virtually non-existent.

Source: adapted from SIMAC, 2012

Questions for reflection

Consider the challenges presented above. Do you notice similarities with your national context? Organise your response per sector of analysis using the table below.

Level	Challenges
Data content	
Organisational	
Technological	

In your opinion, what improvements could be envisaged?

3.3 Conditions of implementation

Computerised databases have enabled a number of operations such as cross-sorting or specific retrieval, thus helping to address specific human resource management matters. The trends observed over the last ten years are promising in terms of achieving enhanced management of teacher information systems. The systematic development of networks should facilitate the work of real-time updating. Changes to the organisation of administrative management and the introduction of an integrated management structure should also enable data updating activities to be optimised and so make data more reliable. In addition, there has been a massive development of management applications, which register the data required for the administrative management of personnel (pay, career progression, promotion, etc.).

Despite increased efforts to make data more reliable, shortcomings still persist. Some conditions need to be taken into consideration for the successful implementation, use and maintenance of information systems. These have been summarized by the ILO (2012, p.18):

- The systems used at different levels (decentralized vs national; Ministry of Education, other government or public sector systems; payroll vs other personal data) must be compatible and integrated and use a single database.

- Political commitment, good governance and strong management are all critical to success, as systems require considerable resources and on-going commitment. Professionalism, accountability, efficiency and competence are essential to their functioning effectively.

- Local involvement and ownership are fundamental to EMIS development based on national education policy and needs, and to its support by national resources. If donor-funded international experts participate in EMIS conception and installation, they should work closely with national counterparts able to continue to develop and support the system to ensure long-term sustainability.

- Users and core professionals should be involved throughout the planning, testing, piloting and roll-out processes and their feedback used effectively.

- Organizational culture must be able to embrace the principles and practice of data use, integration and sharing among departments, and of employees at different levels being empowered to access and use data.

- Data protection and security systems and policies on privacy and confidentiality must be put in place, understood and enforced.

- Once the data and information is available, it can only be effectively used for education decisions if planners and policy makers have the training and capacity to use it effectively and are aware of all the potentialities offered by the EMIS.

- The costs of EMIS development, implementation and maintenance can be extremely high in terms of financial, material and human resources and time; they need to be realistically evaluated and planned for, and financial commitments assured over time.

≔ Highlights

- Ministries of Education are faced with a number of challenges connected to information systems:

  – Incomplete, unreliable data;

  – Delays in data collection, processing and transmission;

  – Multiplicity of databases and absence of liaison;

  – Lack of qualified staff;

  – Lack of tools to make use of the information.

- These are the main causes of much of the malfunctioning in the information systems, which is detrimental to the effectiveness of administration, to teachers' professional commitment and hence to the quality of education as a whole (ghost teachers, mismatching of posts to teacher profiles, etc.).

- However, encouraging improvements can be noted, particularly related to database computerisation. In this respect, the development of interfaces between different databases for automatic cross-referencing is an important step forward.

- Finally, political commitment, good governance and strong management are all critical to success because information systems require considerable resources and a permanent commitment.

Annex 1. Indicators and scoreboards for teacher monitoring

Teacher management is becoming increasingly complex. To address this, synthetic, quantified information is used, i.e. indicators, to provide information on the situation of teaching staff.

Information collected for use in a database serves to calculate indicators for scoreboards. Thus, it is very important to think carefully about information needs before embarking on the design of questionnaires and the development of a database. First of all, it is important to look at what the characteristics of a good indicator are before thinking about the indicators relevant for teacher management.

1.1   Developing an indicator system

Technical dimension

We must first clarify the concepts of: *data, statistic and indicator*.

There are many definitions for the concept of an indicator[3]. You may have already realised that. Some specialists define an indicator as a composite index obtained from complex calculations for synthetic purposes. Others consider that an indicator must describe and underline the system's characteristics, in some cases with a simple category of raw data and in other cases with processed data (e.g. Nuttall's primary and secondary indicators). We could continue at length since the diversity of definitions and approaches is so vast.

However, many specialists concur in defining indicators as statistics that are specifically built in relation to the objectives of the education system, to support decision-making. We shall adopt this definition here. Thus, indicators will be differentiated from the information in standard annual statistical yearbooks. Let us look at an example: the numbers of pupils, teachers, etc. in a statistical yearbook correspond to a series of raw data. However, the indicator will be the pupil-teacher ratio. "It is information processed so as to permit the study of an educational phenomenon"[4]. The indicator enables pupil data and teacher data to be summarised and synthesised in a form adapted to the user's needs. There is clearly a difference in analytical potential.

An indicator system refers to a higher dimension. It allows to measure the different components of an education system and also provides information on the relationship between, and the synergy of, those components in the way the education system works.

There is also a consensus on the fact that indicators can reveal the strengths and weaknesses of the system but they do not allow to explain the reasons behind. Indicators can be compared to a car's dashboard: it warns the driver of overheating but does not give the reasons and even less so the solutions.

To sum up, indicators reveal the 'state of health', but further questions and analysis are required for a diagnosis and the identification of appropriate strategies. Thanks to different indicators, a manager realises that some schools are doing better than, or not as well as, others. However, even if other indicators may sometimes provide a lead towards an explanation, this can only be studied through further (both more statistical and more qualitative) analysis.

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[3] For a broader consideration of the development, utilisation and interpretation of indicators, see: Windham, 1988. Improving the efficiency of the educational system. Indicators of educational effectiveness and efficiency. Albany N.Y.: State University of New York.

[4] Sauvageot, 2003. Indicators for educational planning: a practical guide. Second edition. Paris: IIEP-UNESCO.

A district office wishes to develop indicators to check effective teacher distribution in the schools. It compiles and calculates the following, among many other, data, for each school:

- number of teachers;
- pedagogical group-teacher ratio;
- number of qualified teachers.

Would you define these data as indicators? Justify your answer.

Political dimension

Designing an indicator is not simply a technical exercise; there is also a political dimension. "The transition from statistics to indicators is therefore a delicate passage"[5]. The choice of the levels of data aggregation or of the data in a calculation formula for example will have political implications. A document can thus present the national enrolment rate, or some other indicator, without causing any particular problem – but the same indicator presented per region could cause political tensions and reveal problems if it brings to light strong regional inequalities.

Indicators can be considered as a tool for the formulation of education policy insofar as they reveal the state of the system and so point out possible problems. In some extreme cases, these indicators can be devised in such a way as to present an apparently healthy system whereas a desire to conceal a problematic situation has presided over the choice of the indicators.

Precautions should therefore be taken to protect the integrity and neutrality of the documents supported by indicators, insofar as these have major consequences for politicians when budgeting or designing programmes.

1.2 Indicator characteristics

An indicator is an item of quantified data, which provides only partial information on a generally complex phenomenon (an activity, a situation, etc.). It is an item of synthetic data that provides information on progression, achievement or the state of a situation. By enabling the measurement of the gap between a current situation and a norm, a benchmark or a set objective, the assessment of situations (of disparity in particular), and the comparison of situations, etc., indicators constitute precious monitoring tools of the teacher management system.

The indicators selected must be *reliable and valid*. Other characteristics determine the quality of an indicator, i.e. its usefulness in the decision-making process. In addition, relevance, comparability in time and space, and synthetic capacity should also be highlighted (see box below).

Box A.1: Indicator characteristics

- *Reliability* is defined as the capacity of an indicator to measure, with a relative absence of error, the phenomenon studied, i.e. to obtain the same result when the indicator is applied in the same conditions. This is the degree of confidence that can be granted to the indicator. It depends on a number of parameters, including the quality of the elementary data collection procedures used for calculating the indicator.

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[5] OECD, 1992: 26. The OECD International Education Indicators. A framework for analysis. Paris: OECD/CERI.

- *Validity* covers the capacity of the indicator to measure what it is supposed to measure. For example, attempting to measure the quality of recruitment by the time spent on the operation comes down to using a non-valid indicator.

- *Relevance* is observed by the extent to which the indicator matches the situation it is supposed to give information on. Thus, the rate of absenteeism is a relevant indicator for the analysis of the level of teacher utilisation. However, the enrolment rate is of only marginal interest for the same issue.

- *Comparability* in time and space: an indicator must be able to be compared over time (over several years) and space (between geographical areas or between different countries). This characteristic allows for calculations on the evolution of a situation or on spatial disparities for example.

- *Capacity to synthesise*: an indicator must condense information. The more information it synthesises, the better it will be.

In general, each indicator should be accompanied by a methodological note including:

- list of data used;
- field of observation: type, geographical coverage, education field, etc.;
- date or period of observation;
- sources of information used to mobilise the data;
- calculation techniques and modalities used.

These methodological precautions can both reinforce the reliability of the indicator and facilitate its comparability. In addition, they enable the indicator to be reused by people other than those who have developed it.

1.3 What form can an indicator take?

Indicators can take a variety of forms, such as:

- a data item resulting from calculations made from a number of elementary data
  - ✓ e.g. replacement teacher utilisation rate (= sum of days worked / number of working days)
- a rate or an index of evolution over a period
  - ✓ e.g. growth rate of teachers to retire in the coming years
- a comparison of two data items in terms of difference
  - ✓ difference in gross values: variation in the number of civil servant teachers
  - ✓ difference in rates in percentage points: increase in the replacement rate or fall in the growth rate of non-civil servant teachers
  - ✓ difference in proportions: increase in the share of women among teachers
- a multi-criteria indicator that usually measures a qualitative situation. Several relevant criteria are selected to describe a situation; a mark or a score system is assigned to each of the criteria; an overall mark (average) is then assigned, which represents the indicator related to the phenomenon observed.
  - ✓ e.g. quality index of movement management

This will be the weighted or unweighted average of indicators like the percentage of files behind schedule, the percentage of letters of complaint, the percentage of incomplete files compared to the files to be handled.

- ✓ e.g. school attractivity index

Here, different descriptive indicators should be selected like school location (rural, semi-rural, urban) for context, percentage of success in exams, share of repeaters in the school, for attendance, etc.

A score system will be assigned to each indicator according to its level of attractivity:

- 0 for rural, 1 for semi-rural, 2 for urban

- 0 for a success rate < 50%, 1 between 50% and 70%, 2 > 70%

- 0 for a share of repeaters >20%, 1 between 20% and 10%, 2 < 10%

  and so on for the other indicators.

An overall mark, corresponding to a multi-criteria attractivity indicator, will be given to each school by calculating a weighted or unweighted average of a rate or an index of evolution for a given period.

1.4   Interpreting an indicator

A benchmark should be associated with each indicator to give meaning to the data item calculated.

The benchmark can be:

- an average value: it is usually calculated on a wider field of observation than that of the indicator.
    - ✓ e.g. the rate of teacher absenteeism per subject matter compared to the average rate of teacher absenteeism with all subjects taken as a whole.
    - ✓ The pupil-teacher ratio of a geographical entity compared to the national average.
- a standard, or a norm to be worked towards and/or respected as far as possible.
    - ✓ e.g. the average number of teaching hours compared to service obligation.
    - ✓ The average time taken to process a transfer file compared to a standard duration.

A number of indicators are needed to measure *the multiple implications of a phenomenon.* Each indicator has a different signification and it is not always easy to interpret several different indicators. A good knowledge of policy objectives in terms of personnel management, procedures and management norms is required to analyse the different indicators. Benchmarks are essential in order to interpret the indicators, identify problems and their causes and define solutions.

1.5   Steps in developing indicator systems for teacher management

The indicator cannot be considered as an isolated data item insofar as it is included in the description of a set of activities or missions. The indicator must necessarily be part of an organised set of indicators that will correspond to a general formalised representation of the field to be analysed. There are three main steps:

1. Defining the different fields for which the decision-maker wishes to conduct monitoring actions. In the framework of the human resources function, this means defining the main sub-functions of human resource management and constituting different scoreboards:

    - assessment of staff requirements;
    - recruitment (competitive examinations, management of contract teachers, ...);
    - movement of staff (transfers, assignments ...);

-   training of staff;

-   career management (promotion, pedagogical supervision, etc.);

-   monitoring of teacher utilisation;

-   staff replacement.

Box A.2: Examples of indicators for the 'staff transfer' (movement) function

% of staff who requested their transfer:

$$\frac{\text{Number of staff who requested transfer}}{\text{Total number of staff}} \times 100$$

Movement satisfaction rate:

$$\frac{\text{Requests granted}}{\text{Total requests}} \times 100$$

These indicators can be calculated as a whole or per gender, per subject, per geographical area, per school, etc.

Box A.3: Examples of indicators of potential problems in teacher training

FIELDS	INDICATORS
Total training expenditure	Variation in spending on training from one year to another or over a given period
Distribution of training expenditure	Differences in spending structure according to different criteria: professional category; gender; job; age; seniority; type of training course
Staff trained and number of training hours	Number of staff trained per category, gender, job, age, region, etc.
	Number of training hours per person trained
Training course organisation	Average training duration per category
	Number of registrations per course
	Rate of participation per course: number of registrations/number of attendees
	Trainer-trainee ratio: number of trainers/number trained
	Number of dropouts during the course
	Number of years the course has existed
	Numbers trained per type of course
Training outcomes Assessment of training impact	Variation in the quality of work after the course
	Rate of promotion in the trained population
	Trained staff satisfaction index
	Rate of training refusal
Training department	Cost of central training department/cost of decentralised training departments
	Cost of training department/total training expenditure
	Qualifications of training department personnel

The indicators as listed in the table must be explained in detail.

Examples:
The variation in training expenditure can be expressed

- in absolute value, i.e.   "Expenditure (n - 1) - Expenditure (n)"

- in relative value, i.e. $\dfrac{\text{"Expenditure (n - 1) - Expenditure (n)"}}{\text{Expenditure (n - 1)}} \times 100$

To measure the differences in the structure of expenditure according to professional category, one can calculate
- either the amount of overall training expenditure per category
- or the training expenditure per person from each category

2. Describing the activities in the selected field. This will involve breaking down the activities, describing the inter-activity sequence constraints, identifying the actors concerned and specifying the timetables.

3. Finding the indicators that describe the selected field of activities in the most precise, comprehensive and dynamic way possible. A standardised presentation will facilitate this process and should include:

- context indicators representing elements on which decision-makers can hardly intervene given their scope of competency;
- indicators of resources describing the potential support for actions to be implemented;
- results indicators which, in the framework of HRM, are presented in the form of a report;
- process indicators that describe the processes set up in the selected field of activity.

Questions for consideration

Imagine that you have to design an information system. Think about your needs and draw up a list of variables that need to be collected in your database for one of the major sub-functions of human resource management:

- assessment of staff requirements,
- recruitment (competitive examinations, management of contract teachers, …),
- movement of staff (transfers, assignments, …),
- training of staff,
- career management (promotion, pedagogical supervision, …),
- monitoring of teacher utilisation,
- staff replacement.

Which indicators would you like to be able to analyse?

1.6 Disseminating information

Once the indicators have been calculated, the information must be shared and analysed. Otherwise, the work done will have served no purpose. Different types of documents have to be drawn up in order to disseminate the information: reports or statistical yearbooks, scoreboards, study reports, guidance notes.

Before going further into the topic of the presentation of the information, we suggest looking briefly at the institutional and political aspects of the use of information. The best possible documents will often have little impact if they do not benefit from political support and interest.

1.6.1 Institutional aspects

The structural organisation is essential for the quality and consistency of information. Situations where the same information is produced by several sources with different values are all too familiar. This is an example of the consequences of institutional malfunctioning.

> "The consistency and survival of complex systems depends on the effectiveness and the relevance of the information circuits and procedures between the different elements of the system and between the system and the outside world ".[6]

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[6] Taken from: Michel, 1992. « Pilotage d'un système complexe : l'éducation nationale ». Administration et éducation. N° 52, 2nd quarter.

Coordination in data collection and communication must be strengthened and, first of all, included in the official institutional procedures. This concerns both vertical and horizontal communication: political and administrative coordination (particularly via training sessions, meetings), setting up of an official calendar of surveys for the ministry (statistical and other departments) prepared, if possible, by the statistical department. It is also important to question the procedures and work organisation in place, and to identify all possible obstacles in order to achieve a more effective work organisation.

This coordination is delicate from a technical and structural point of view. Moreover, it must not be forgotten that communication is closely related to power. This affects the dissemination of information and more particularly the distribution of information at the different administrative levels. However, the circulation of information throughout the different sub-systems is necessary for the education system to function properly. This condition is related to the needs identification stage enabling the information to be sorted and communicated in appropriate forms at the different decision-making levels.

It is important to keep in mind at all times the objectives of the analysis and the profiles of the users: researchers, general public or decision-makers. In particular, the latter are priority beneficiaries of an analysis of the results that should be presented in an abridged version with an emphasis on action.

Those in charge at local level are just as concerned as the decision-makers at central level by the development of a culture of information utilisation. A communication strategy including the local level can enable local authorities to enhance the quality of the schools in their constituency thanks to decision-making tools. School monitoring can be carried out from a limited number of indicators, drawn from the regular collection of information. These indicators must reflect the direction and objectives pursued at local level. The educational district can thus give a statistical profile to each school and collect reactions and suggestions. Depending on the degree of school autonomy, the school will also be able to produce information at its own level, and take the implications of the information into consideration.[7]

1.6.2 Scoreboards

Once data processing has been completed, the results (or their synthesis) are communicated by means of tables, graphs, etc. enabling an optimal communication of the information. These can be grouped together in scoreboards. Indicators presented in this way address the different monitoring needs.

A scoreboard is a human resource monitoring tool and a decision-making tool. It is made up of a set of indicators or "flashing lights" enabling to follow the evolution of an organisation, warning of a shift, a malfunction or a social risk. It is designed to give decision-makers the means to foresee and, if needs be, to undertake any necessary corrective action.

It addresses needs: for periodical information, comparison (compared to predefined norms or to the same indicator at a previous date), diagnosis and forecasting.

A scoreboard is a coherent collection of indicators whose main functions are:

- to obtain information periodically or on request;
- to provide indications of costs;
- to supply information on functioning;
- to follow an evolution;
- to inform on the achievement of objectives or norms.

The purpose of this information set out in a scoreboard is to help with forecasting and decision-making. However, to make it more functional and user-friendly, the scoreboard must highlight key information. To do so, there must not be an excessive number of indicators as this makes the scoreboard less

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[7] Chapman and Mählck, 1993. 'The strengths and weaknesses of information systems in educational planning'. IIEP Newsletter. 11 (2), pp. 10-12.

readable. The choice of the forms of representation is also of crucial importance (graphs, histograms, etc.). The profile of the end user can help to determine the most appropriate type of representation. Finally, the use of colour, whether in the graphs or for the data, can help in detecting "critical' situations, compared to a threshold or a norm for example.

Box A.4: Using the indicators in scoreboards

Indicators grouped together in a system or in the form of scoreboards are preferred monitoring support tools. They enable specific monitoring objectives to be addressed by:

- *establishing a picture of the situation in order to conduct a diagnosis of the field of activities studied. The objective is to quantify what is intuitive in an objective way.* The quantitative expression of management activities and the diagnosis are a way for the manager or the decision-maker to appreciate, and to report on, the achievements associated with a management system.

- *highlighting issues that are specific to the field studied* in order to lead to an operational approach to the diagnosis. The objective is to assist in decision-making, in setting specific objectives and in quantifying in the form of indicators, which can lead to the elaboration of an administrative service project, or even a reform of the management system.

- *evaluating the effects of management practices and/or of new policies* by monitoring all the way through the management process. This implies observing the evolution of the indicators connected to changes in management methods and measuring the gaps between set objectives and those attained.

- *addressing forecasting needs.* Formalising the management process in an indicator system facilitates *de facto* the production of forecasting models.

Highlights

- An indicator is a measurement tool that expresses a quantitative value characterising a phenomenon that cannot be grasped directly. It is an item of often synthetic data that informs on the progression, achievement or state of a situation.

- The quality of an indicator is measured through five criteria: reliability, validity, relevance, comparability and capacity to synthesise.

- Indicators can be classified per category to constitute different scoreboards: recruitment, assignment, training, cost, efficiency, etc.

- A scoreboard enables the dissemination and analysis of the information identified by the indicators. It is a human resource monitoring and decision support tool that enables corrective actions to be planned and undertaken as necessary. It requires the setting up of a single database for human resource management, to be shared with the different database users.
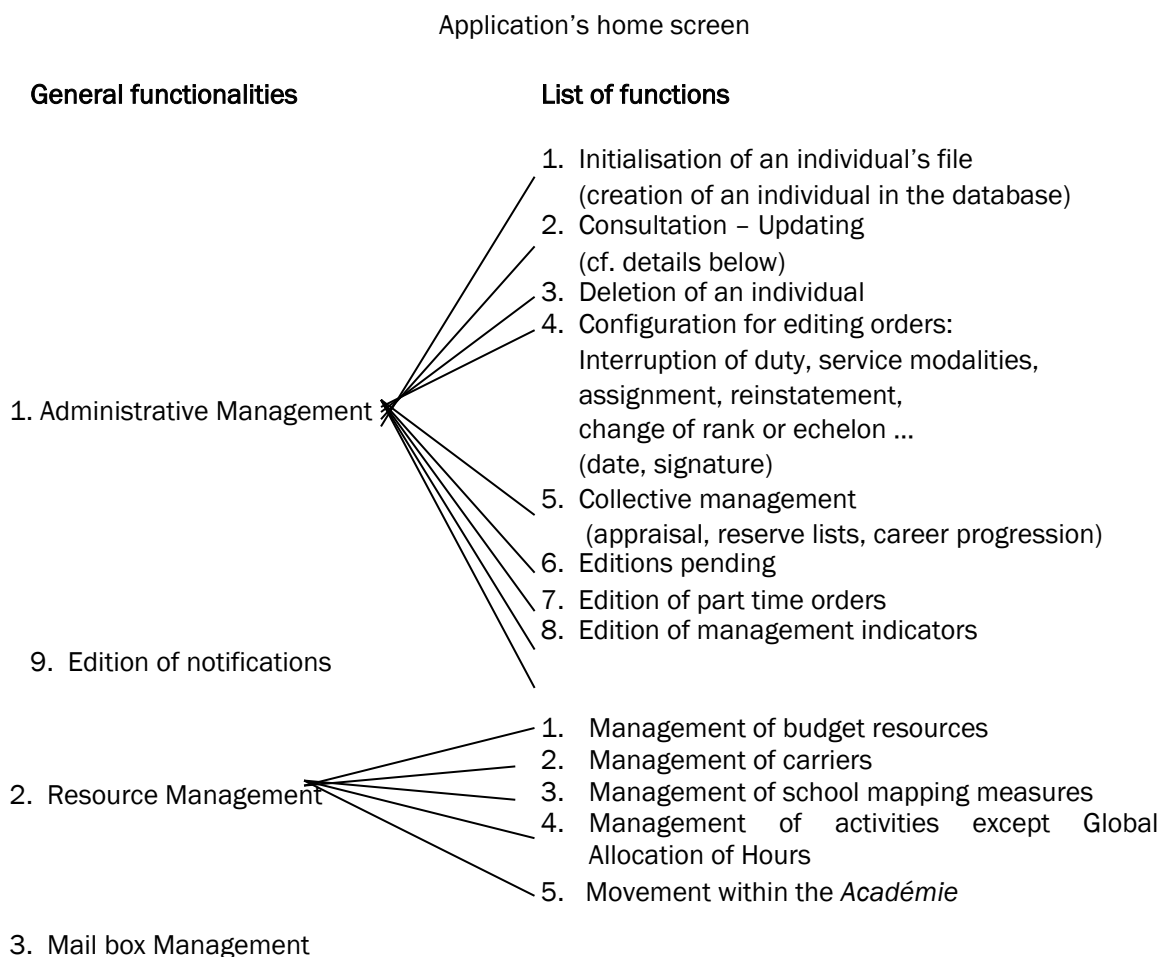
Annex 2. Country example, France

2.1 Teacher management database

In France, there is a national computer application named EPP (*Emplois, Postes, Personnels* – Jobs, Posts, Personnel) for the management of the jobs, posts and personnel in public secondary education. This database is used at national level and at *académie* (a group of several *départements*) level.

It is updated at national level (delegated posts) and at *académie* level (local education authority and schools) for the allocation of posts to schools and individual personnel data. These data are shared between the national (ministry) and *académie* (local education authority) levels and the public secondary schools (lower secondary and general or vocational upper secondary).

It is not possible to explain all the functionalities of this application in detail here. However, the content of some consultation and database update screens can be found below.

Figure A.1: Functionalities of the "Jobs, Posts, Personnel" database

Application's home screen

General functionalities	List of functions

1. Administrative Management
   1. Initialisation of an individual's file
      (creation of an individual in the database)
   2. Consultation – Updating
      (cf. details below)
   3. Deletion of an individual
   4. Configuration for editing orders:
      Interruption of duty, service modalities,
      assignment, reinstatement,
      change of rank or echelon …
      (date, signature)
   5. Collective management
      (appraisal, reserve lists, career progression)
   6. Editions pending
   7. Edition of part time orders
   8. Edition of management indicators
9. Edition of notifications

2. Resource Management
   1. Management of budget resources
   2. Management of carriers
   3. Management of school mapping measures
   4. Management of activities except Global Allocation of Hours
   5. Movement within the *Académie*

3. Mail box Management

On choosing 1 – "Administrative Management", and then 2,

the following screen appears:

<table>
<tr><td colspan="2" align="center">**Consultation – Updating**</td></tr>
<tr><td>1. Personal data</td><td>2. Family status</td></tr>
<tr><td>3. Children</td><td>4. Address – Telephone</td></tr>
<tr><td>5. Diplomas</td><td>6. Ranks</td></tr>
<tr><td>7. *Echelons*</td><td>8. *Chevrons*</td></tr>
<tr><td>9. Positions</td><td>10. Leave</td></tr>
<tr><td>11. Service modalities</td><td>12. Military status</td></tr>
<tr><td>13. Assignments</td><td>14. Assignments-secondment</td></tr>
<tr><td>15. Seniority – Dates</td><td>16. Marks</td></tr>
<tr><td>17. Management units</td><td>18. Notice of overall mark</td></tr>
</table>

N.B. the sections related to diplomas are rarely filled in.

Details of a choice 2 function – "Consultation – Updating"

<table>
<tr><td colspan="2" align="center">Choice 10 – Leave</td></tr>
<tr><td>1. Sick leave</td><td>2. Authorised leave of absence</td></tr>
<tr><td>3. Other leave</td><td>4. Declaration of pregnancy</td></tr>
<tr><td>5. Maternity leave</td><td>6. Long-term sick leave</td></tr>
<tr><td>7. Long-term leave</td><td>8. Leave for serious illness</td></tr>
<tr><td>9. Historical deletion</td><td>10. General history</td></tr>
</table>

N.B. The head teachers provide Information on sick leave and authorised leave of absence.

This database enables the processing, at *académie* level, of some collective personnel management operations like, for example, the movement of personnel, marking, changes of echelon and the preparation of changes of rank.

Data that are useful for these collective operations are extracted from the database to fuel specific programmes.

By way of example, the movement of personnel named "Decentralised National Movement Management", is carried out in two stages: the inter-*académie* movement that processes useful EPP data at national level (personnel entering their preferences, in each *académie*, on the Internet); the

intra-*académie* movement which assigns personnel entering the *académie* (result of the inter-académie movement) and those requesting a transfer within the *académie*.

2.2   Scoreboards

Scoreboards are commonly used in the administration of education in France. In terms of regular personnel management, there are tables per *académie* to monitor secondary school teaching posts ("management of allocated budget resources" which can be edited at any time from the Jobs, Posts, Personnel database), to monitor teacher or administrative personnel replacement credits, to monitor the utilisation of the contract teacher post contingency, etc. It mainly concerns monitoring the consumption of budgetary resources for teacher recruitment.

Collective teacher management operations (promotions, movement) and in-service training are also the subject of assessments and of one-off annual studies, scoreboards fulling, and institutional communication toward the Ministry, trade unions and teachers.

At secondary school level, an Internet connection to a monitoring database allows the head teachers to visualise, in real time, scoreboards presenting all the characteristics of the students and teachers.

However, this database is insufficient for a human resource approach since it does not include staff's initial (academic and vocational) and continuing training nor does it include their career path.

2.3   Publication and communication of information

Once a year, the Ministry of National Education publishes a document entitled *'L'état de l'école'* (The state of school) available on the ministry's website. This publication groups together the key statistical indicators to analyse the French education system, including human resources, and to appreciate the policies in place. Organised around the resources assigned to schools (*costs*), schooling conditions (*activities*) and pupils' *results*, it strives to describe the main ongoing trends and puts the spotlight on international comparisons. It underlines the efforts already put in and the progress still to be accomplished.

SUMMARY

Costs

Activities

Results

Source : Ministry of National Education, Tertiary Education and Research. 2014. « *L'état de l'école »*. Paris : Ministère de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche.

7. National Education Personnel

In the 2013-2014 school year, the Ministry of National Education,Tertiary Education and Research remunerated 1 047 500 people, of whom 911 400 belonged to the public sector and 136 100 to the private sector under contract. Overall, 80.9 % of those were teachers.

During the 2013-2014 school year, 1 047 500 people were paid on government funds by the Ministry of National Education, Tertiary Education and Research: 847 300 were teachers in the public sector and in the private sector under contract, i.e. 80.9% of all personnel (table 7.1). The number of teachers included trainees with full responsibility for a class as of the beginning of the 2010-2011 school year; this regulation was applied up to the start of the 2013-2014 school year. The number of teachers also included eligible candidates assigned as "eligible contract teachers" for a half-time teaching service on average for the 2013-2014 school year. Counted as the equivalent of full time staff, 7 600 teachers thus joined the total number of teachers at the beginning of the 2013-2014 school year.

In primary education, since the mid 1990's, the trend had been for a slight rise in the number of teachers (+4.7% until the beginning of the 2010-2011 school year); this trend was interrupted in 2011-2012 and 2012-2013. The number of teachers increased once again at the beginning of the 2013-2014 school year (figure 7.3). In secondary education, the progression in teacher numbers at the beginning of the 2013-2014 school year followed on from a steady decline since 2002-2003 (almost 56 000 fewer teachers up to 2012-2013), contrasting with the previous phase of growth.

Following their assignments to schools, 370 200 teachers were working in public primary schools or in the classrooms of private primary schools under contract and 477 100 in public or private secondary schools (table 7.2). 200 200 members of staff occupied the different administrative and technical functions, as well as supervision, inspection, education, guidance and educational assistance functions in public schools, in local education authorities, in national education divisions in the 'départements' and in central administration. Among these, 89 800 education assistants, pedagogical assistants and school auxiliaries worked in public secondary schools. The personnel belonging to other ministries (Agriculture, Defence, Health) or to private organisations, and who participate in the education of the total of around 12 million pupils, are added to the above.

Alongside the teachers, the other members of personnel are head teachers, principal education advisers, inspectors, guidance and documentation staff, and administrative, technical, social and health staff. From January 2007 to January 2009, the sharp drop in non-teaching staff was mainly due to bringing unskilled workers and technical assistants under the scope of the local authorities.

The personnel taken into account had a paid permanent job with the Ministry of National Education, Tertiary Education and Research within the programmes of the interministerial "school education" mission (MIES) in the framework of the LOLF (1st August 2001 organic law on the finance laws, implemented on 1st January 2006). Staff were counted in physical numbers, with the exception of eligible contract teachers, recruited specifically for 2013-2014, on a part-time basis (half time on average). For the other teachers, the average quota is very close to full-time. The LOLF covers missions, programmes and actions. A programme groups together the funds for the implementation of an action or of a consistent set of actions under the same ministry. Personnel paid on non-contract private schools' own funds as well as Tertiary Education and Research staff are not taken into account.

National Education Personnel

7.1 Evolution of the number of National Education personnel (excluding tertiary education)

		1999-2000	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Teachers*	Public	734 977	712 453	720 655	712 625	705 351	711 165
	Private	139 650	140 454	138 639	137 022	136 316	136 094
	Total	874 627	852 907	859 294	849 647	841 667	847 259
Administrative, technical & supervisory staff**		311 232	210 393	203 494	193 898	200 975	200 249
including education auxiliairies, education assistants & pedagogical assistants***		61 470	83 969	82 980	83 542	90 754	89 827
Total		1 185 859	1 063 300	1 067 788	1 043 545	1 042 642	1 047 508
Share of teachers****		73.8%	80.2%	80.5%	81.4%	80.7%	80.9%

* Teachers in public and private primary and secondary schools, including trainees assigned directly to a school since the beginning of the school year 2010-2011 and eligible contract teachers recruited for the 2013-2014 school year.

** Staff paid under "Tertiary education and university research" and "Student life" included in the publication The State of Tertiary Education and Research in France have no longer been included since 2007. This is also the case, as of 2010, for personnel working in central administration and paid under Tertiary Education.

*** The last headcount of education auxiliaries took place over the 2006-2007 school year.

**** The share of teachers was recalculated of the total, including education assistants.

Scope: Metropolitan France + DOM (overseas territories), including Mayotte starting 2011.
Source: MENESR-DEPP

**7.2 Distribution of National Education personnel in January 2014**

Type of personnel	Number
Public primary education	326 782
Private primary education	43 379
Public secondary education	384 383
Private secondary education	92 715
Total teachers	847 259
Administrative, technical & supervisory staff	110 422
Education auxiliairies, education assistants & pedagogical assistants	89 827
TOTAL	1 047 508

*Excluding personnel paid under « Tertiary education and university research » and those working in central administration and paid under Tertiary Education.

Scope: Metropolitan France + overseas territories
Source: MENESR-DEPP

7.3 Comparison in evolution of numbers of pupils and teachers
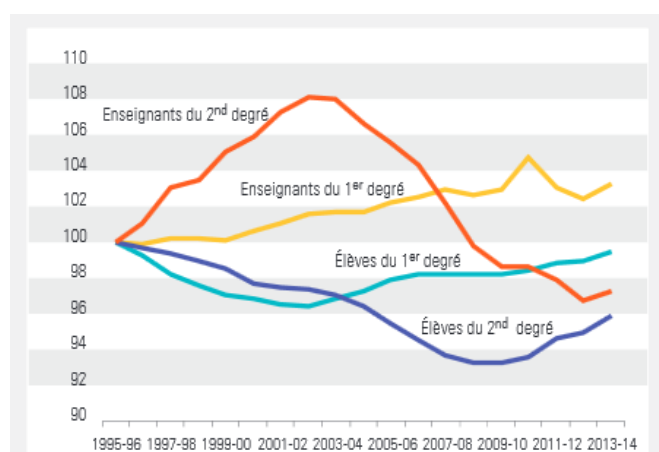
Translation : *Enseignants du 2nd degré* / Secondary teachers
Enseignants du 1er degré / Primary teachers
Elèves du 1er degré / Primary school pupils
Elèves du 2nd degré / Secondary school pupils

Scope: Metropolitan France + DOM (Overseas territories), including Mayotte as of 2011.
Source: MENESR-DEPP

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