AN INFORMATION MODEL TO MANAGE STUDENTS' INFORMATION IN MALAYSIA

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ABSTRACT

The advent of powerful computer systems and sophisticated software has enhanced the strategic roles of information system in business (Somogyi, E.K. & Galliers, R.D., 1987). Effective use of information systems can definitely change the basis of competition of an organization (Parker, C.S, 1993). As a result, there has been a widespread use of information systems both in the private and the public sectors.

Since 1996, a few information systems have been introduced to the Malaysian schools but without great success (Tee, 2000). As part of the Smart School Project, the Ministry of Education then introduced The Smart School Management System (SMSS) to the smart schools (Government of Malaysia, 1997). This ambitious system aims to provide extensive functions for the administration of schools and the management of student data. However, to date, we have yet to see the implementation of SMSS in all the schools.

This paper describes an information model suitable for the management and exchange of students' information in the Malaysian Education System. The designed model covers both the data domain and process domain of Zachman's Information Systems Architecture (Zachman, J. A., 1987). In designing the model, an analysis of user requirements was carried out to ensure that this model satisfies the requirements of teachers, schools and the Ministry of Education. A prototype information system has been developed to demonstrate the viability of such a model.

INTRODUCTION

As an important resource of any organization, data must be managed at the corporate level efficiently and effectively (Conger S. A., 1994). Data management requires careful planning. The efficient management of data depends on the following 3 factors:

a. Good working procedures
b. Professionalism of the database administrator
c. Efficient use of information and communication technology (ICT).

In recent years, the advent of powerful computer systems and sophisticated software has enhanced the strategic roles of information system in data management. The use of

information systems to manage corporate data is not new to the business world. However, it is yet to be fully exploited by the schools in Malaysia.

Since 1996, a few information systems have been introduced to the Malaysian schools (Tee, 2000). Most of these systems (e.g. EMIS) focus more on the gathering of data for the Ministry of Education. They have very few useful functions for the users in the schools. In 1997, the Malaysian government proposed the implementation of Smart School as one of the flagships of the Multimedia Super Corridor project (Government of Malaysia, 1997). Under the Smart School, an integrated Smart School Management System (SSMS) will be developed. SSMS constitutes one of the first initiatives to introduce a large information system into the Malaysian education system.

THE SMART SCHOOL MANAGEMENT SYSTEM

The primary objective for SMSS is to support teaching and learning functions by managing resources and processes more efficiently and effectively (Government of Malaysia, 1997). The Concept Request for Proposal (CRFP) for SMSS categorised the Smart Schools functions into 9 areas, namely school governance, student affairs, educational resources, external resource, finance, facilities, human resource, security and technology (Government of Malaysia, 1997). The detail description of these 9 functional requirements shows that SMSS emphasizes more on school administration then functions that support the learning process. SMSS should be able to support the sharing and exchange of data between SMSS and other systems. Unfortunately, at the time of this writing, we are still unable to evaluate the effectiveness of SMSS as the development of the system is still in progress.

THE NEED TO DEVELOP AN INTEGRATED INFORMATION SYSTEM TO MANAGE STUDENTS' INFORMATION

There are many reasons why the Malaysian schools require an integrated information system urgently. Firstly, statistic shows that in 2001 there are 7305 primary schools and 1713 secondary schools with a total enrolment of about 4.93 millions students in Malaysia (see Table 1). The amount of data generated daily by the schools is enormous. An information system is certainly needed to efficiently manage these huge databases. Secondly, analysis shows that there are frequent exchange of data between the schools and other divisions in the Ministry of Education. The timely flow of data between these stakeholders has always been a problem. Therefore, an online integrated information system will help in the efficient and timely transfer of data, and thus provide a solution to this problem. Thirdly, there is need to develop a system to allow the sharing of student information among the various system that may be implemented in the schools, such as the Library System. Lastly, it is high time to automate some of the schools' administrative processes so that the non-teaching tasks of teachers can be lightened.

Table 1: Number of Primary and Secondary Schools, Enrolment, Teachers and Classes in Malaysia as at 31 January 2001

Type of School	No. of Schools.	Total Enrolment	No. of Teachers	No. of Classes
Secondary	1,713	2,015,579	115,098	58,748
Primary School	7,305	2,916,841	157,985	92,788
Total	9,018	4,932,420	273,083	151,536

Source: http://www2.moe.gov.my/~bppdp/erangka2001.htm

ANALYZING THE REQUIREMENTS

Functionality of the System

The main function of the system is to maintain a comprehensive database of student records. This includes the ability to add records during student's registration, archive records and transfer records between schools and other organizations in the ministry. With a comprehensive database of student data, the system shall be able to generate useful statistics and reports for the decision-making process. Apart from this, the system should also be able to support all matters and activities of the students in the school. These functions include:

- Keep track on students' disciplinary problems.
- Process evaluation and academic records.
- Book loan application processing.
- Maintain co-curricular activity records.
- Process class attendance records.
- Process registration of public examinations.
- Transfer of student information to another school.
- Maintain records on student who stays in the hostel.
- Collection of fees, if any.

One of the important features of the system is the ability of the system to share its data with other information systems. Therefore, this system should be able to interact with other information systems that may be implemented in the schools.

Data maintained in the databases

Based on the functions mentioned above, the following data shall be maintained in the databases of the system.

- Student personal particulars
- Parents personal particulars
- Student class attendance
- Evaluation records
- Disciplinary records

- Co-curricular activities records
- Book loan records
- School profile
- Records on public examination registration
- Record on transfer of students
- Hostel information
- Data on the classes attended by students
- Subjects taken by students

Data flows between schools and other organizations

As an entity way down in the organization chart of the Ministry of Education, the schools interact directly with the State Education Departments. They also interact indirectly with the other divisions in the ministry. Therefore, there is a frequent flow of data between the schools and the other divisions as described below.

a. Interactions between primary school, lower secondary school, upper secondary school and the State Education Department

   The State Education Department is responsible for the selection and posting of students to the respective schools. This happens when

   i students are transferred from primary school to secondary school after having completed the primary education.
   ii students are selected to enroll in Form 4 after the PMR examination.
   iii students are selected to enroll in Lower Six or matriculation classes after the SPM examination

b. Interactions between schools, State Education Department and the School Division

   The State Education Departments and the School Division require enrolment statistic for some planning and decision-making processes. Other information that are sent regularly to the State Education Department and the School Division are:

   i. disciplinary reports, if any
   ii. co-curricular activities records
   iii. evaluation and academic records
   iv. records for students on transfer

c. Interactions between schools, State Education Department and the Examination Board

   There are 4 main public examinations for the students, namely UPSR, PMR, SPM/SPMV and STPM. The students have to register in order to sit for these examinations. Hence, schools interact indirectly with the Examination Board through the State Education Departments. Candidates' information is sent to the Examination Board. On the other hand, examination results of the candidates will be released to the State Education Departments and then to the schools.

d. Interactions between schools, State Education Department and Book Loan Division

Schools need to send information on students who are receiving book loan to the Book Loan Division via the State Education Department.

e. Interactions between schools, State Education Department and Education Planning and Research Division

Education Planning and Research Division requires information on school's enrolment for research and planning purposes. Therefore, there is a data flow between the schools, State Education Department and the Education Planning and Research Division.

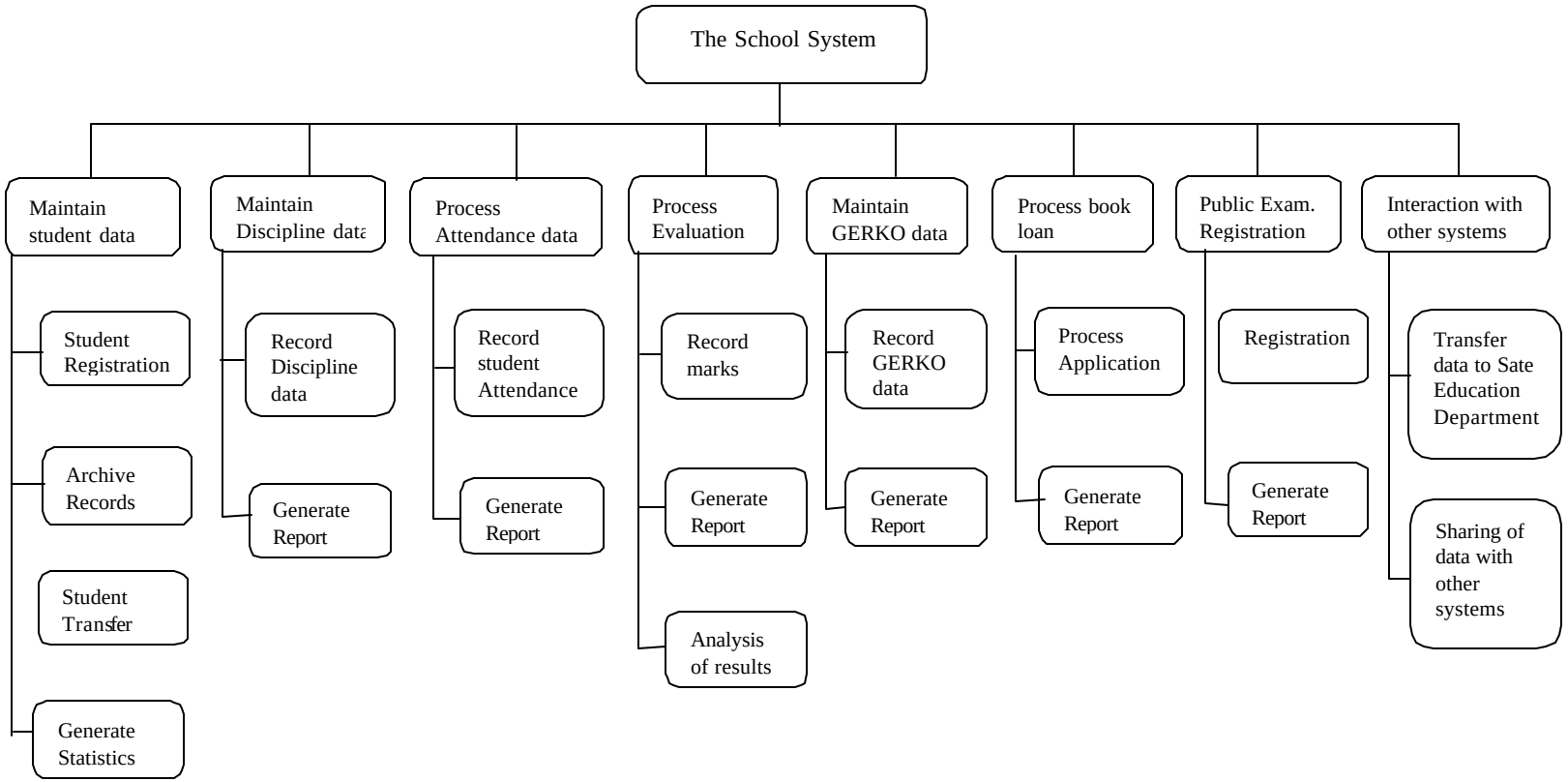
f. Interactions between technical schools and Technical Education Division

Technical schools and polytechnic are directly under the care of Technical Education Division, so they do not have to interact through the various State Education Departments. The Technical Education Division needs enrolment data of technical schools. So, there is an exchange of data between technical schools and the Technical Education Division.

g. Interactions between schools, State Education Department and the School Inspectorate

Students' information is also needed by the School Inspectorate. Normally, the School Inspectorate obtains the information she needs from the various State Education Department.

Figure 1: The Functional Decomposition Diagram



BUILDING THE INFORMATION MODEL

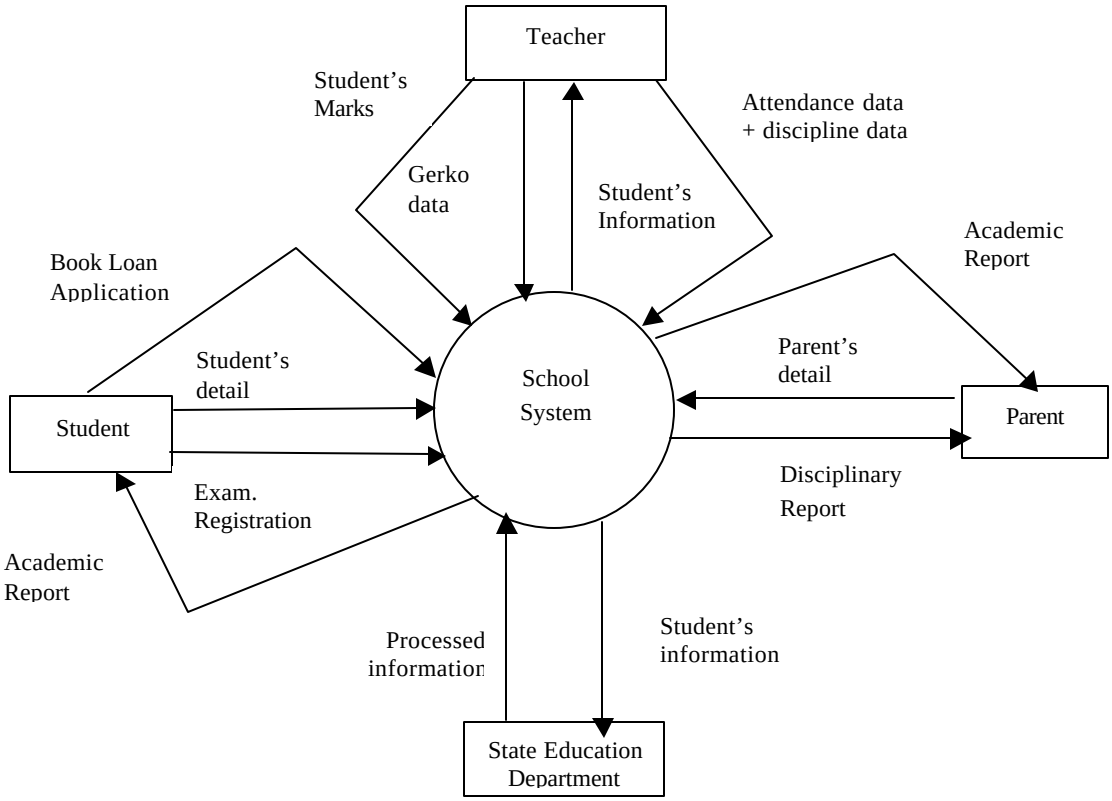
The Functional Decomposition Diagram

Based on the functionality described above, the Functional Decomposition Diagram of the model is shown in Figure 1. This diagram shows the main functions and activities of the proposed school system.

The Context Diagram

The context diagram for the school system is shown in Figure 2. There are 4 main external entities. The context diagram shows the type of data that flows between these entities and the system.

Figure 2: The Context Diagram



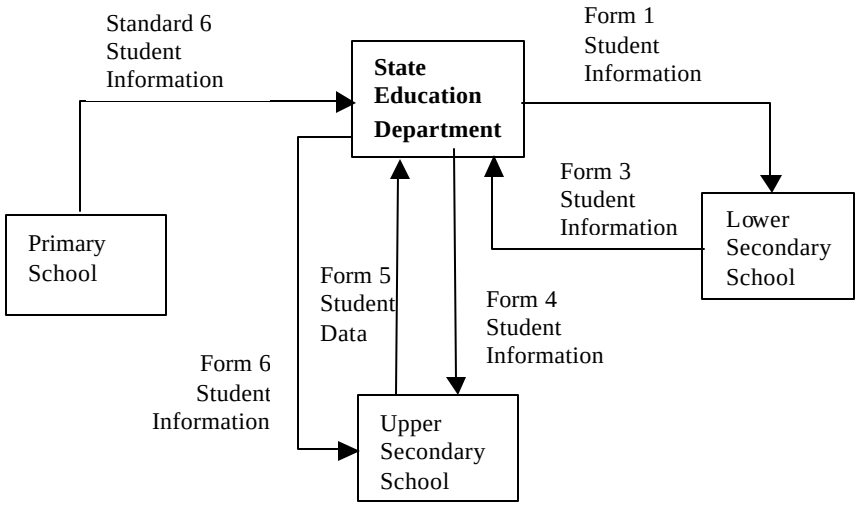
Data Flows between the schools and other organizations

Analysis shows that there are regular exchanges of data between schools and other organizations in the Ministry of Education. The design of the information model highlights these strong linkages.

a. Data flows to facilitate the transfer of students between schools

The Malaysian School System consists of 6 years of primary education, 3 years of lower secondary education, 2 years of upper secondary education and 1-2 years of pre-university education. The promotion of students from one level to the next level of the system usually involves the transfer of students from one school to another. Figure 3 shows the exchange of data between the schools and the State Education Department that facilitates this transfer of students.

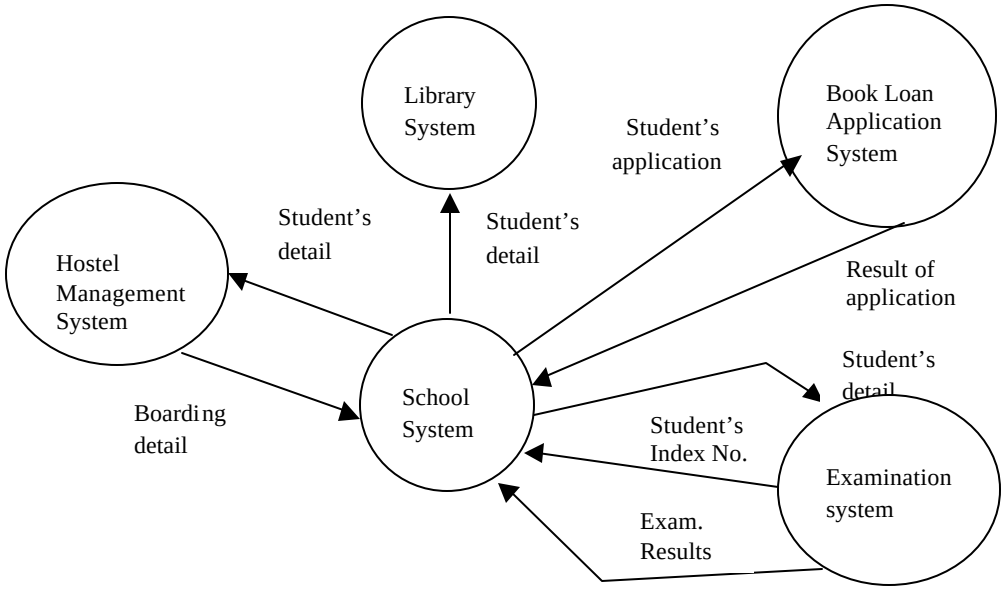
Figure 3: Data Flows between schools and State Education Department



b. Interactions between school system and other information system

The school system has to interact with other information systems that are in use so that data can be transferred to or import from these systems. Figure 4 shows how the school system interacts with some of these information systems.

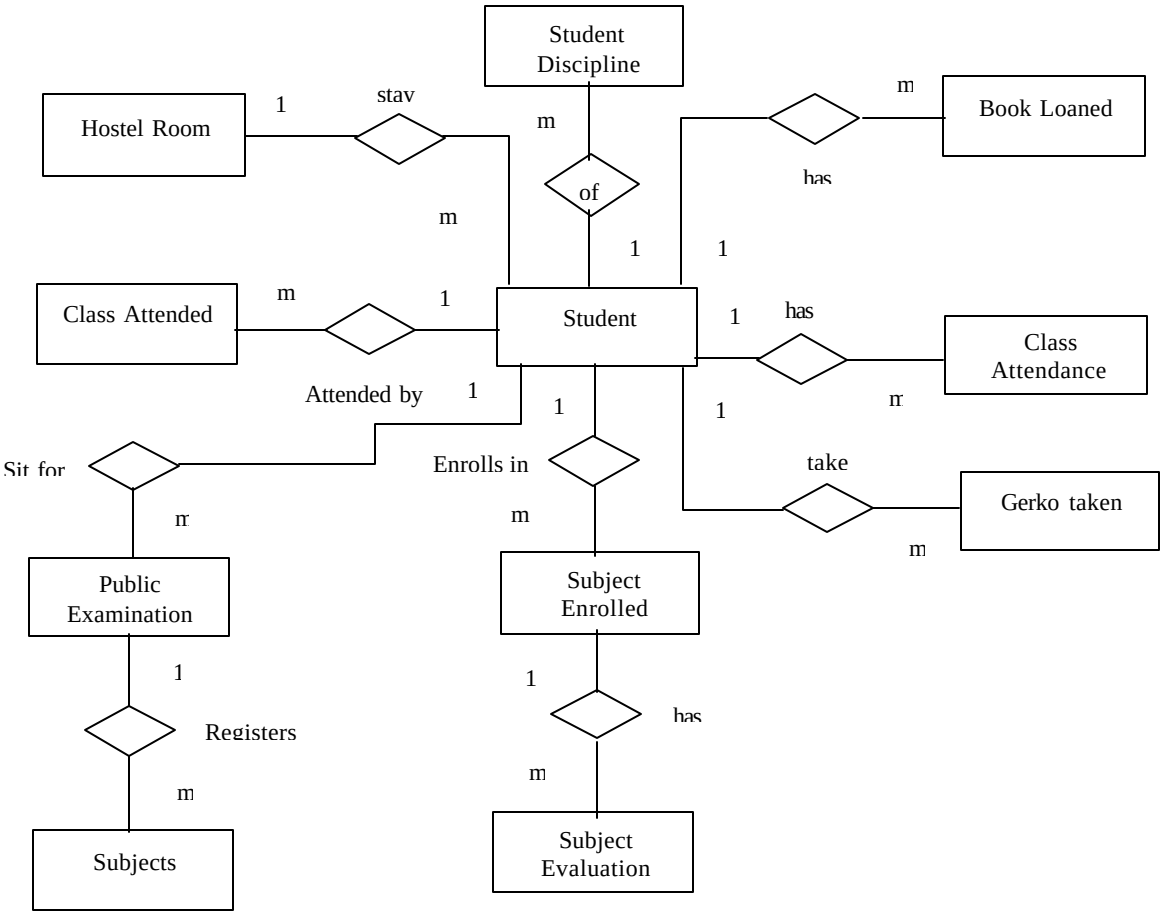
Figure 4: Data Flows between the School System and other information systems



Entity Relationship Diagram

The Entity Relationship Diagram of Figure 5 shows the data stores that have been identified during data analysis of the system. These data stores constitute the main repository of data for the system. They clearly reflect the functionality described above.

Figure 5: Entity Relationship Diagram



IMPORTANT FEATURES OF THE INFORMATION MODEL

Information systems that were introduced earlier to the Malaysian schools have one or more of the following weaknesses.

- They do not satisfy user requirements
- They are mainly used for the gathering of data
- They do not have functions that support the learning activities of students
- There are no functions to enable the exchange of data at the ministry level

Bearing in mind these weaknesses, an improved information model has been designed. This model incorporates the following important features to ensure that it satisfies the user requirements of all stakeholders concerned.

a. It has a rich set of functions to be used by the teachers in their daily activity. (e.g. recording of class attendance, entering of marks.)
b. It maintains a comprehensive database of student data.
c. It shares its data with other information systems. (e.g. Library system)
d. It allows the transfer of data to the State Education Department and other divisions in the ministry.

The design of this model is not just based on the requirements of the schools or the requirements of the State Education Department, but it takes care of the requirements of the whole education system.

CONCLUSION

The introduction of a comprehensive information system to manage students' information in Malaysia is long overdue. The information model described in this paper provides a useful starting point for the development of such a system. The design of this model is based on the requirements of the schools and the Ministry of Education; therefore it caters to the needs of the whole education system. As we ponder on the strategic roles of this system and its capability to manage information that are generated by more than 5 millions students, there is no reason why the Ministry of Education shall not invest in the development of such a system.

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