

# Design of School Management Information System Based on the Indonesian National Education Standard

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## ABSTRACT

With a population of around 237,424,363 in 33 provinces, Indonesia is one developing countries that needs an excellent School Management Information System (SMIS) to accomplish its educational mission. To reach the goal, it is necessary to know the rules, culture of school and related data prior to building the SMIS. This study is focused on the Indonesian National Education Standards. It has nine standards that are described by the Regulation of Education Ministry. To manage the schools' organization, this paper aims to develop a SMIS based on the Indonesian National Education Standards by using ARIS(Architecture of Integrated Information System) to help schools run efficiently. The new system will be built using UML(Unified Modeling Language), this new system conforms to the education rules of the government. Finally, the conclusion and future research are described.

**Key words:** Management Information System, School Management Information System, Architecture of Integrated Information System, Unified Modeling Language

## 1. INTRODUCTION

Indonesia is one of developing countries with around 237,424,363 inhabitants and 33 provinces. Since 21<sup>st</sup> Century, the education system of Indonesia has been strategically reformed to be more competitive. However, the rank of Indonesia was 48 out of 56 countries in reading, 52 in science, and 51 in mathematics in 2006. The rank of Indonesia was 36 out of 49 countries in the Trends in International Mathematics and Science Study (TIMSS), and ranked 35 in science in 2007. This data indicated that Indonesian students still rank low on international standardized tests. The fact demonstrates that Indonesia must concentrate on ensuring high quality of education to improve access and performance.

Generally, public sector organizations tend to be more cautious and more concerned with rules and regulations [5]. According to the Republic of Indonesia laws Number 20 of 2003 about National Education Systems, there are three levels of education: Basic Education, Secondary Education, and Higher Education. Basic Education consists of Primary School (SD)/Islamic Primary School (MI), and Junior

Secondary School (SMP)/ Islamic Junior Secondary School (MTs). Secondary Education consists of General Senior Secondary School (SMA)/Islamic General Senior Secondary School (MA), and Vocational Senior Secondary School (SMK)/Islamic Vocational Senior Secondary School (MAK).

The business school has been using computer to support learning significantly, which IT professionals are trained and prepared to meet industry [13]. A business must manage the use of information correctly, as the data was collected either personally or through mail to meet the demands of the changing world.

Educational and school councils were eager to make education become more productive. Bandur [2] mentioned that Indonesia school council has been empowered to design strategic planning for school development, determine learning standards in the school, and decide on the provision of incentives to the principal, teachers, and administrative staff, etc., with the guidelines of the Ministry of National Education issued in 2002 and 2004 and Education Act No.20/2003.

Demir [8] mentioned that SMIS computerized the basic subject of today's school management and SMIS aims to provide support for the managing and educational activities of the school managers by processing information. Also it is needed to describe the process of

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school business. ARIS is the business process modeling tool that provides a “complete” description of a business process [1] by using EPC (Event-driven Process Chain) model. But ARIS is not, strictly speaking, a tool, but a concept [7]. EPC model consists of sequence of events triggering business function [17], which provides comprehensive means for modeling the relevant aspects of business process [15], and becomes the central model for all business modeling in ARIS.

In addition, Davis [7] remarked that ARIS has supported for modeling software system using UML. UML is a standard language for writing software blueprint, and a common standard for object-oriented modeling, which can help to represent a complex system as a set of simple diagram, charts, and narratives [3], [11], [17].

To manage the school organization, this paper aims to develop a SMIS based on the Indonesian National Education Standards by using ARIS and use the school information efficiently. Finally, a design of the new system will be built by using UML, and this new system conforms to the education rules of government.

## 2. EDUCATION SYSTEM OF INDONESIA

Related to Kelegai and Middleton [13] on education, they stated that policy makers must have confidence that educational institutions are able to produce people to meet the demands of the changing world and the people are trained and prepared to meet industry needs and especially school industry. The quality of the education must be supported by existing organizations and adjusted according to the rules of the country for example, the rules of Indonesian Education System. They mentioned that common elements of information policy, includes: identifying the information needs of the nation, devising ways of achieving these needs, and promoting effective use of the resulting service. Most of the elements are presented in the National Education Standards, which education sector of Indonesia is used to manage the education industry of the country.

According to Republic of Indonesia laws Number 20 of 2003 about National Education Systems, Indonesia has the porridge of education as follows: basic education, secondary education, and higher education.

### 2.1 Basic Education

Basic education [16] is education that underlies secondary education. Basic education consists of:

- 1) Primary School / *Sekolah Dasar* (SD)
- 2) Islamic Primary School / *Madrasah Ibtidaiyah* (MI)
- 3) Junior Secondary School / *Sekolah Menengah Pertama* (SMP)
- 4) Islamic Junior Secondary School / *Madrasah Tsanawiyah* (MTs)

Children ages 6–11 attended SD or MI. This level of education is compulsory for all Indonesian citizens, based on the national constitution.

Junior Secondary School, generally known by the abbreviation SMP or MTs is part of basic education in Indonesia. After graduating from Primary School, students attend SMP or MTs for three years from 12-14 years old.

### 2.2 Secondary Education

Secondary education [16] is continuation of basic education which consists of:

- 1) General secondary education is simply the university-preparatory school, consist of:
  - General Senior Secondary School / *Sekolah Menengah Atas* (SMA)
  - Islamic General Senior Secondary School / *Madrasah Aliyah* (MA)
- 2) Secondary vocational education resembles more of a vocational school, consist of:
  - Vocational Senior Secondary School / *Sekolah Menengah Kejuruan* (SMK)
  - Islamic Vocational Senior Secondary School / *Madrasah Aliyah Kejuruan* (MAK)

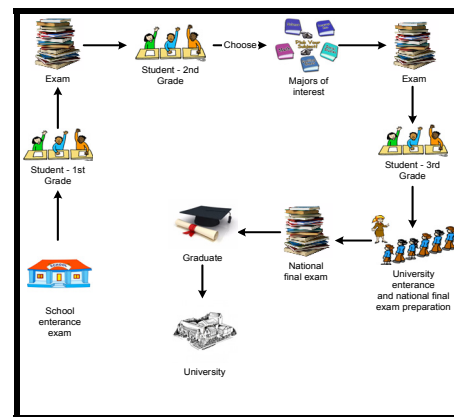


Fig. 1. General secondary education schema

The students in SMA or MA are prepared to continue their study to university (Fig. 1), while students in SMK or MAK are prepared to work after graduation without going to university (Fig. 2).

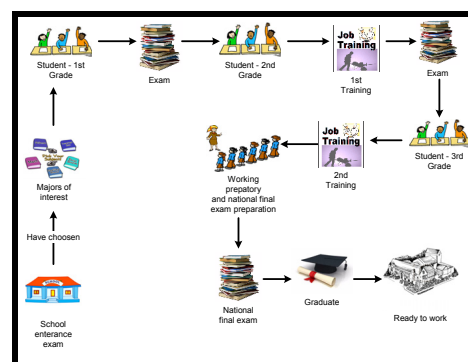


Fig. 2. Secondary vocational education schema

**2.3 Higher Education**

Higher education [16] is education after secondary education, which includes educational programs diploma, undergraduate, magister, specialist, and doctoral degrees held by higher education with an open system.

**2.4 Regular school and Islamic school**

In the regular school (also called general school) and Islamic school, their curriculum are same. The difference is that Islamic school (private or national) generally use Islamic uniform, and all the students should follow the rules of Islamic rules, and so on. In regular school (private or national), the attribution (uniform), and the rules depend on each school based on government regulations of education that is seen in Fig. 3.



Fig. 3. Photographs of Indonesian schools uniform

In this paper, the education system about the uniform or rules of school is not covered, but it is generally described in National Education Standards of Indonesia.

**2.5 National Education Standards**

Indonesian education has standardization that National Education Standards is the minimum criteria of the education system by the National Education Standards Institution [16]. The function and goal of National Education Standards are as follows:

- a. As a basis for planning, implementation, and supervision of education in order to realize the quality of national education.
- b. Aimed at ensuring the quality of national education in the framework of the nation's intellectual life and character forming as well as the civilization of the nation's dignity.
- c. Enhanced in a planned, directed, and sustained in accordance with the demands for changes in local, national, and global.

Table 1. Criteria of National Education Standards [16]

| No | Regulation of Ministry Number | About                                     | Criteria          |
|----|-------------------------------|---|-------------------|
| 1  | Number 22 of 2006             | Content Standards for Basic and Secondary | Content Standards |

|    |                     | Education Unit.  |   |
|----|---------------------|--|---|
| 2  | Number 23 of 2006   | Graduates Competency Standards for Basic and Secondary Education Unit.   | Competency Standards                    |
| 3  | Number 13 of 2007   | Standard Head of School / Madrasah.  | Education and Educators Standards       |
| 4  | Number 16 of 2007   | Academic Qualifications and Competency Standards Teacher.  |   |
| 5  | Number 24 Year 2008 | Labor Standards Administration School / Madrasah.  |   |
| 6  | Number 25 of 2008   | Standard Power Library School / Madrasah.  |   |
| 7  | Number 26 of 2008   | Power Standards Lab School / Madrasah.   |   |
| 8  | Number 19 of 2007   | Standards Unit Management Education by Primary and Secondary Education.  | Management Standards                    |
| 9  | Number 20 of 2007   | Educational Assessment Standards.  | Education Assessment Standards          |
| 10 | Number 24 of 2007   | Infrastructure Standards for SD / MI, SMP / MTs, and SMA / MA.   | Facilities and Infrastructure Standards |
| 11 | Number 41 of 2007   | Process Standards for Elementary and Secondary Education Unit.   | Process Standards                       |
| 12 | Number 69 of 2009   | Standard Operating Costs Non-personnel For Primary Schools / Madrasah Ibtidaiyah (SD / MI), Junior Secondary School / junior secondary school (SMP / MTs), General Senior Secondary School / Madrasah Aliyah (SMA / MA), Vocational Senior Secondary School (SMK), Primary School Foreign ordinary (SDLB), Junior Secondary School Extraordinary (SMPLB), and General Senior Secondary School Extraordinary (SMALB). | Education Financing Standards           |

In the criteria of National Education Standards elaborated in Table 1, there are twelve Regulations of Education Ministry, or eight criteria and they are used to analyze the Indonesian Education System.



**3. ANALYSIS OF SCHOOL MANAGEMENT INFORMATION SYSTEM**

**3.1 Naming Table**

The Indonesian National Education Standards (NES) are analyzed by using ARIS model – EPC. In table 2, there are two important types of objects used in the EPC. The first is Event that represents the pre-condition and post-condition changing state as process proceeds by the business model. The second is Function that represents the activities or tasks that are triggered by event specifically, and produces new events. The events or functions are cannot be connected to the same type of the object, such as event to event, or function to function.

Table 2. Event and function description

|         | Event  | Function   |
|---------|--|--|
| Meaning | Represent the changing state of the world as a process | Represent the activities or tasks that carried out as part |

|              | proceeds  | of a business process   |
|--------------|---|---|
| Naming       | Noun (information item) + Verb (action)   | Verb (action) + Noun (information item)   |
| Detail       | Pre-condition (before activity can proceed)                                       | Represent specific; well-understood activities                                    |
|              | Post-condition (result of the activity)   | Not to use ambiguous descriptions   |
| Object       | People or computer  | People or computer  |
| Relationship | Event activates the function  | Function will always create one or more new events                                |
|              | Event triggered function  | Function produce new events   |
| Prohibited   | Event connect-Event   | Function connect Function   |
| Symbol       |  |  |

The major important to draw the EPC model is naming an event and function. In Fig. 4, it is given an overview of the process of naming an event and function which are good and appropriate to the rules as described on Table 2.

| No | Type | Description | Preceding | Relationship |
|----|------|-------------|-----------|--------------|
|    | E    | F           |           |              |
|    |      |             |           |              |
|    |      |             |           |              |
|    |      |             |           |              |

Fig. 4. Event and function naming process

Naming table is used to analyze the SMIS based on NES (Fig. 4), before drawing the EPC model to make sure the naming of events and functions are followed by the rules. By using this naming table, it is help to check each event (E) and function (F) names are appropriate or not, thereafter followed the preceding number to drawing the EPC model step by step. Finally, the relationship between the assignments of function is shown to connect to another EPC models.

### 3.2 EPC Models of Content Standards

The Content Standards (CS) [16] are including the scope of materials, and at least a minimum level of competence to achieve minimum competency on the level and type of education, which is developed by National Education Standards Institution (BSNP) of Indonesia. In this paper, one of Content Standards are presented in Fig. 5: *basic framework and curriculum structure*.

According to Regulation of Education Ministry number 22 of 2006 [16], the basic framework and curriculum structure are guideline to prepare the curriculum at the level of the education. The regulation also mentioned that curriculum for this type of general education, vocational, and specialized of basic education and secondary education, consists of a group of subjects who have their own purpose and scope. In this paper, the SMIS is focused on analyzing the type of regular education, and special education (such as Islamic School).

In developing the basic framework of the curriculum, besides a group of subjects, the principles of curriculum development, and the implementation of the curriculum are

also important to build the SMIS. The other one is the preparation of curriculum structure, which is a pattern and arrangement of subjects that must be taken by learners in learning activities.

In the case, there are four EPC model for Basic Framework and Curriculum Structure. In Fig. 5, the function's part of EPC model, with name's *packet system* has an assignment to EPC model, as called as **Model CS\_2**. Fig. 5 is presented the process of Learning Burden on National Education Standards of Indonesia, which is a part of Content Standards.

### 3.3 EPC Models of Management Standards

National Education Standards Institution (BSNP) [16] indicated that each educational unit is required to follow or satisfy the management standards of education nationally. In the case, Management Standards (MS) by using the EPC model of ARIS has eleven models. In this paper, Management Standards are presented one of them: *work plan implementation*.

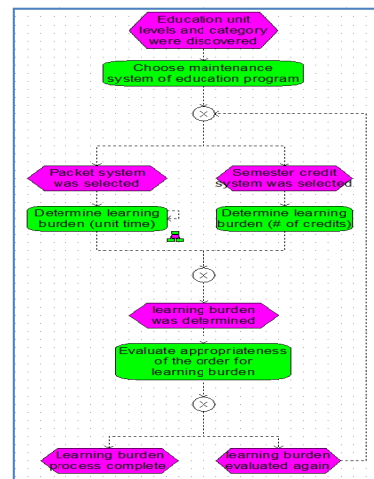


Fig. 5. EPC model – Learning burden(Model CS\_2)

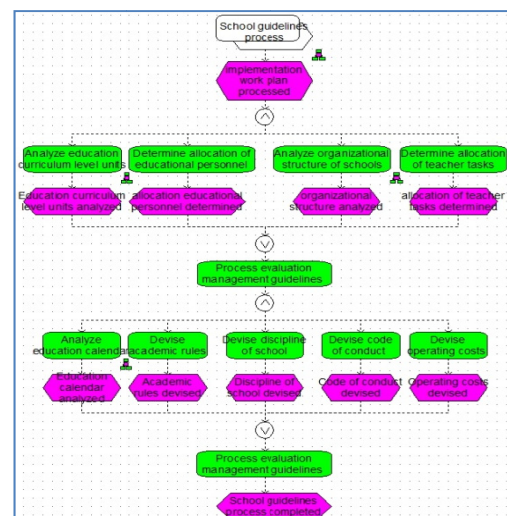


Fig. 6. EPC model – Work plan implementation (Model MS\_2A)



This EPC model, as shown in Fig. 6, *work plan implementation* is opened with process interface, as called as *school guidelines process*, which is easily understood where the process came from. In the Fig. 6, the detail of school guidelines is described. There are three functions that have assignment to EPC models, consist of: **Model CS\_1A**, **Model MS\_2B**, and **Model CS\_3**. The school guidelines are completed when all the rules are satisfied.

#### 4. DESIGN OF SCHOOL MANAGEMENT INFORMATION SYSTEM

The design of SMIS, by using two diagrams of UML: use-case diagram, and sequence diagram is described. In the case, there are only two standards of NES that developed: Content Standards, and Management Standards. Borland Together 2008 (Service Pack 1) was used to construct the prototype of the SMIS with the UML 1.4 Project model, which are based on the EPC model presented in previous section. This program is running in the personal computer with processor Intel® Core™ i3, CPU 3.07GHz, and RAM 4.00 GB. In this paper, the UML diagram is presented two use-case diagrams, and sequence diagrams of Content Standards and Management Standards.

##### 4.1 Content Standards

##### 4.4.1 Content Standards - Use Case Diagram

In this paper, two use case diagrams are presented about the Content Standards. The first use case is *basic framework and curriculum structure*. In this use case diagram, it is shown that there are five actors (educators, staff, headmaster, school committee, and students), and 38 use cases used to develop the SMIS.

The part of the use case diagram result of *basic framework and curriculum structure* related to the educator actors is shown in Fig. 7 modeled by Borland Together. In the case, the actor *educator* has five use cases that is a part of *make curriculum*, such as: *select curriculum development*, *select curriculum structure*, *select curriculum implementation*, *select curriculum content*, and *select time allocation*.

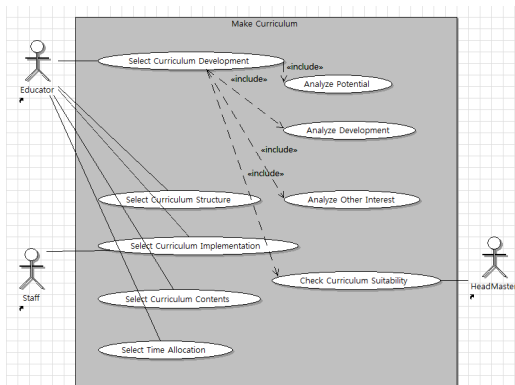


Fig. 7. Use case diagram – Basic framework and curriculum structure

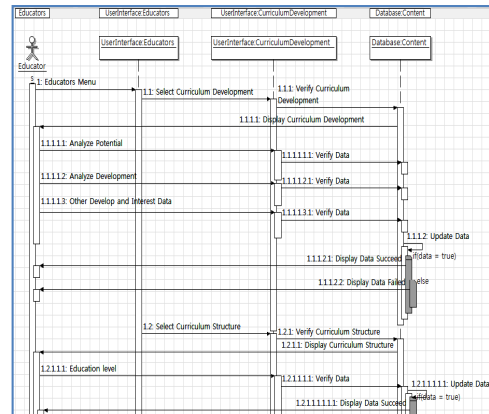


Fig. 8. Sequence diagram – Basic framework and curriculum structure (educator task)

##### 4.2 Content Standards - Sequence Diagram

The Content Standards sequence diagram is presented in this section. The first diagram is shown in Fig. 8, which is part of *basic framework and curriculum structure* (educator task) sequence diagram. It is indicated that the *educator* can working with five parts, from message 1.1 until 1.5., when one of the messages are selected, then the system will verify the selection. Thereafter, user can directly work with another menu, which is part of the selection. After user finished that work, the system will update the data, and the *if-else condition* is appeared. If the data is true, the system will display a success message to the user. If the data is false, the system will display a failed message to the user. When the user chooses to end the SMIS, this system will be ended. Thereafter, the system will be exited.

#### 5. MANAGEMENT STANDARDS

##### 5.1. Management Standards Use Case Diagram

As shown in Fig. 9, the use case diagram is shown two important actors: *administrator* and *educator*. The actor *administrator* has 5 use cases, and *educator* has 9 use cases.

In the Fig. 9, the *administrator* will help the SMIS to input vision, mission, and goals of the school. The other work that the *administrator* can do is input data, such as the school provision, which there are six parts of the provision, etc. The *administrator* also should select the provision that is entered by the *educator*.

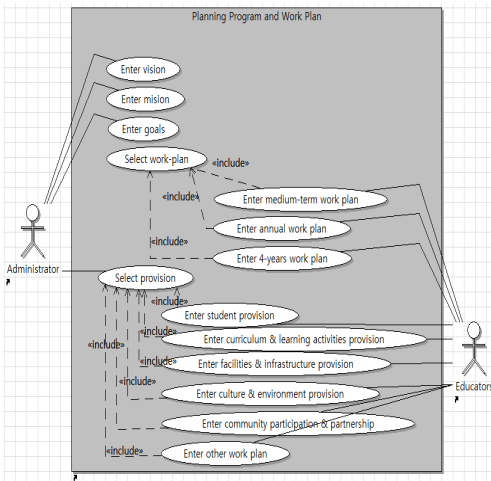


Fig. 9. Use case diagram – Planning program and work plan

5.2 Management Standards - Sequence Diagram

As shown in Fig. 10 there are three objects: first is **UserInterface:Administrator**, which helps the administrator to work in their own windows, and chooses the menu inside the SMIS. The second object is **UserInterface:PlanningProgram & WorkPlan**, that this object function takes the user to working in the planning program and work plan windows. The third object is **Database:Management**, that each process in Management Standards will be connected to this object.

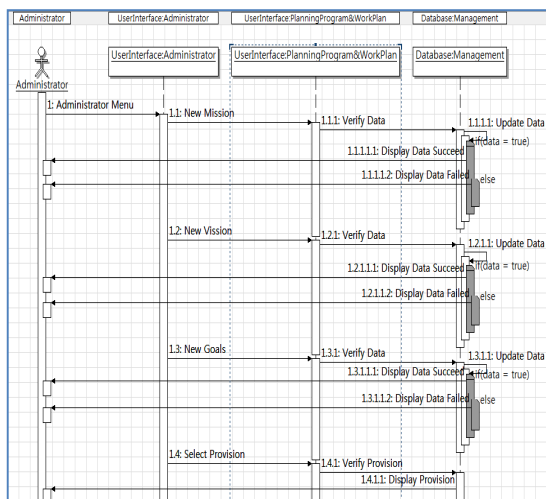


Fig. 10. Sequence diagram – Planning program and work plan (administrator task)

As shown in Fig. 9, the administrator has 5 use cases, and the administrator can work for input the information that user needed in the SMIS. When the administrator met the message in administrator menu, the actor chooses one selection, and then the data will be verified in planning program and work plan side. Thereafter, each data are updated in the **Database:Management** of SMIS. After the user finished using the system of planning program and work

plan, then the user can exit the program, and the SMIS program will be closed.

6. CONCLUSION

In the future research, there are several topics that can be developed. The first, SMK/MAK or Vocational Senior Secondary School is not considered in this paper. The SMK current development in Indonesia has begun to increase. Therefore, applying the SMIS to the SMK/MAK can be done with real data collection and more detailed analysis. The second, there are two standards of NES had been developed. The other six standards of NES are important to meet the greatest SMIS for Indonesian school. These six new systems Standard of NES can be more specific by using the UML diagram. The third, this analysis of process need to be proved by using questionnaire for each school environment, and directly interview to the headmaster, so that the accuracy of the data to be analysis can be improved. Thereafter, the analysis by ARIS can be more detailed by added another function, such as organization, and EPC tools (database, documents, etc.) that provided by ARIS software. The fourth, the design of new system in this paper is using two diagrams: use case diagram and sequence diagram. To make the design more complete and flexible, the other diagram such as class diagram, activity diagram, and another diagram that the system needed can be added. The fifth, the new system in this paper is a prototype of the scenario of the developing system that presented in UML diagram. The programming solution can be added to make the new system can be applied in the real life, by using programming language, with object oriented approach. The last, maximizing the usefulness of information must be collected, considering the development of SMIS at present day can be change at any time. Web-based and network system can be proved in the Indonesian SMIS, by centered on the nation’s capital, which is information derived from the subsections in each region of Indonesia. The SMIS would support a better result, especially in determination of decision, collection of information at the running time, and reduce cost of transportation (because the information that user needed, can be access at any time and any place).

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