

Conceptual model of executive information system data (A Case Study at The State Islamic University of Sunan Gunung Djati Bandung)

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Abstract. Information Technology (IT) is the key role to enhance the quality of Higher Education, by designing and implementing Executive Information System (EIS). EIS is one of the ways used to improve the competitive advantage of Higher Education. EIS can improve services to the internal information needs of Higher Education and can be used to predict/ give input to business decisions that will be taken by the University. Information obtained by extraction and transformation of operational data of Higher Education and collected in data warehouse. The transformation is done by several stages, formulation, aggregation and validation so that the data obtained in accordance with the interest of business analysis of Higher Education. Because of this research will focus on how to design the appropriate categories, schemes and data models to design the EIS Higher Education.

1. Introduction

Higher Education is an educational unit organization that conducts an education in highest level education, research, and community service. Higher Education is a place for the campus community. As an organization, universities have structures, rules of task completion, which include the division of tasks between functional groups and between citizens in the same group, activity plans, and objectives [1].

Technological devices are designed to enhance a quality of human's life [2], one of those which are enable efficiency and effectiveness in business process within a field of higher education business process is information systems. This system is a combination of information technology utilizations and human activity upon a set of agreed procedures [3], information system (IS) has a high level of flexibilities to develop and scalable [4]. EIS is generally known as a branch of IS applications.

Refers to several research, an expert system has a high capability in supporting business process on organization activities: the system has an accurate data accessibility and efficient run-time[5], high accuracy [6], and to support a proper decision [7], low cost[8], extended accessibility[9], intensify user knowledge[10], increase productivity [11], and provide a better data and information [12]. In the organizational structure of universities, there is an institution that is tasked to carry out the function of "Tridharma Perguruan Tinggi", namely education, research and community service, as well as managing science and technology in line with the field of study that is called the study



program. In order to realize public accountability, the study program must actively build an internal quality assurance system [14][15][16]. To prove that the internal quality assurance system has been implemented properly and correctly, the study program should be accredited by an external quality assurance institution. With a good quality assurance system, the study program will be able to improve the quality, uphold the autonomy, and develop themselves as the organizers of academic/ professional programs in accordance with the field of study they manage, and participate in improving the moral strength of the community in a sustainable manner. To that end, the government through RISTEKDIKTI gives responsibility for the implementation of program accreditation to the National Accreditation Board for Higher Education (BAN-PT). The National Accreditation Board for Higher Education through its rules at number 3 in 2017 stipulates that the accreditation system uses the Online Higher Education Accreditation System (SAPTO) [15].

Among the accreditation process, the study program or department is required to prepare useful data to support the process. some of the data needed include data about lecturers, students, use of funds, and the resulting work. So far there is no support system for the availability of such data. so that data collection can take quite a long time and a considerable energy. Therefore, it takes a system that can support the availability of data in the process of accreditation [17].

Systems that can support this process are systems that act as business analytics or commonly known as Executive Information System (EIS). Because this system includes the acquisition of data and information from various existing sources and then processed into a form of data needed. In general, EIS can achieve success criteria such as assisting decision-making with better speed and quality, accelerating operations, maximizing the value of available products, anticipating new opportunities and so on [18].

2. Research methods

This study uses a case study approach that focuses on the implementation of zachman framework to analyze EIS at the State Islamic University of Sunan Gunung Djati Bandung [19].

Data collection methods used in this study are: 1) Observation: Data collection methods to be done is to see and study problems that exist in the field are closely related to the object under study, 2) Library Studies: The methods undertaken as learning materials by searching supporting materials in problem definition through books and the internet [20].

2.1. Executive information system

EIS is a suite of applications and technologies for collecting, storing, analyzing, and presenting data access to help corporate leaders in decision making. EIS is an analytics tool used to consolidate data, analyze, store and access multiple data to assist in decision making, such as software for database queries and reporting, tools for multidimensional data analysis, and data mining [21].

In general, EIS is a process for extraction of operational data of a company and collecting it in a data warehouse. During the extraction process can also be transformed by applying various formulas, aggregation, and validation so that the data obtained in accordance with the interests of business analysis. The results of this simplification and summary are presented to end users who are usually business decision makers. Thus, the EIS process results are also a reflection of the overall performance of the company [22].

- needs and designs of system boundaries represented by architects as designers.
- The Builder Perspective (Physical Technology): A physical model that optimizes design for specific needs within the specific technology boundaries, people, cost and timeframe specified by the engineer as builder.
- The Implementer Perspective (Component Assemblies): Specific technology, about how components are assembled and operated, is configured by technicians as implementers.
- The Participant Perspective (Operation Classes): The real-life system events used by technicians as participant.

For the second dimension, each issue of perspective requires a different way of answering the fundamental question: who, what, why, when, where and how. Each question requires an answer in a different format. Zachman describes each fundamental question in the form of a column/ focus:

- What (data column): the material used to build the system (inventory set).
- How (function column): perform activities (process transformations).
- Where (network column): location, topography and technology (network nodes).
- Who (people column): rules and organization (organization group).
- When (time column): events, cycles, schedules (time periods).
- Why (goal column): purpose, motivation and initiative (motivation reason).

3. Results and discussion

Based on data collection then the next process will be mapping the problem into the zachman framework to produce the required system design. Once the problem map is obtained then the next issues will be arranged in the framework of the zachman matrix. After the zachman matrix is obtained, each row and column of the matrix will be described one by one. This result presents a zachman matrix from the mapping of the problem that has been done.

3.1. Perspective planner

In the first part of the perspective planner which is also often called the contextual architecture that describes the processes that occur information systems in general.

3.1.1. What (data). This column describes the data presented from the planner's point of view. The data is data coming from 3 database that is database of SIAKAD, Registration, and EIS.

3.1.2. How (process). This column describes the process of what happens in the information system that is built EIS information system. This process is divided into 3 main processes namely: a) The process of exporting data into files with extension .xls, b) Data governance process that includes CRUD (create, read, update, delete) process in Lecturer Activity module, Achievement of Lecturer, Funds and Activities, Data Accessibility, and Lecturer Room, c) The process of changing the accreditation year.

3.1.3. Who (people). This column describes the human resources that play a role in the processes that occur in EIS. Users who play a role in this information system is the chairman of the State Islamic University of Sunan Gunung Djati Bandung.

3.1.4. When (time). This column describes the usage schedule or the time when this information system is needed. Use of this information system that is before the accreditation process, if any new data to be added, or when needed as a material for decision support.

3.2. Perspective owner

From the point of view of the owner will be described about the proposal of an information system and how the system will run.

3.2.1. What (data). This column describes the concept of a simple business model that is limited to entities related to the process of the EIS. The entity is divided into tables derived from the SIAKAD, Registration, and EIS database used in this information system. Entities or tables involved in the process that exist in this information system can be seen in Table 1 below.

Table 1. Entity list.

Database Name	Table Detail
Database SIAKAD	pegawai, dosen, pg_jabatan_akademik_ref, pg_status_ikatan_kerja_dosen, pg_pendidikan_formal, s_matakuliah_kurikulum, s_sifat_matakuliah_ref, mahasiswa, mahasiswa_keluar, s_aktivitas_mengajar_dosen, s_matakuliah_kurikulum, pg_dosen_studi_lanjut, program_studi, s_dosen_tugas_akhir, pg_publikasi_dosen, s_semester, pg_pembiayaan_penelitian_ref, pg_media_publikasi_ref
Database Registrasi	Pendaftar, mahasiswa
Database EIS	Aksesibilitas_data, dana_kegiatan, daya_tampung_ref, jenis_data, jenis_kegiatan_dosen, kegiatan_dosen, organisasi_dosen, penggunaan_dana_ref, prestasi_dosen, ruangan, ruang_kerja_ref, setting, sistem_olah_data, sumber_dana_ref, tingkat_ref

3.2.2. *How (process)*. This column discusses the translation of the processes that occur in the EIS is:
a) Users export data from available modules by pressing the export button on the module page, b) The user performs the data management that includes the CRUD process on the module available, c) Users may make changes to the year of accreditation.

3.2.3. *Who (people)*. This column explains who the human resources are involved in the process of developing this EIS. HR involved is a researcher and chairman State Islamic University of Sunan Gunung Djati Bandung.

3.2.4. *When (time)*. This column describes the time required in the construction of information systems to get a prototype of this information system. Here is the time schedule of the initialization process to get the system prototype.

No	Activity Plan	Output Target	May				June				July				August			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Project preparation	Problem defining																
		Stipulation of project schedule																
2	Analysis and application phase into Zachman framework	Data retrieval																
		System requirements determination																
		Prototype problem creating with Zachman matrix using the determination of column What, How, Who, When, Why and the problem solving																
3	Implementation	System prototype discover																

Figure 1. Time schedule process owner.

3.3. Perspective designer

In this point of view discusses the logic model and its needs for the information system as the basic form of the system design that will run.

3.3.1. *What (data)*. This column describes the relation between tables in more detail. This model is a relation schema from the existing table in the EIS.

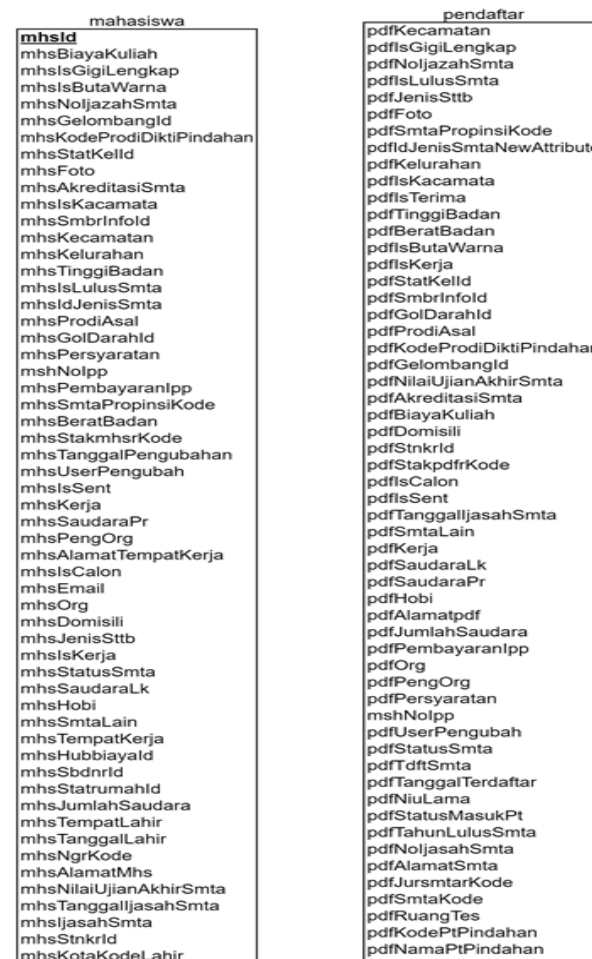


Figure 2. Registration database relation scheme.

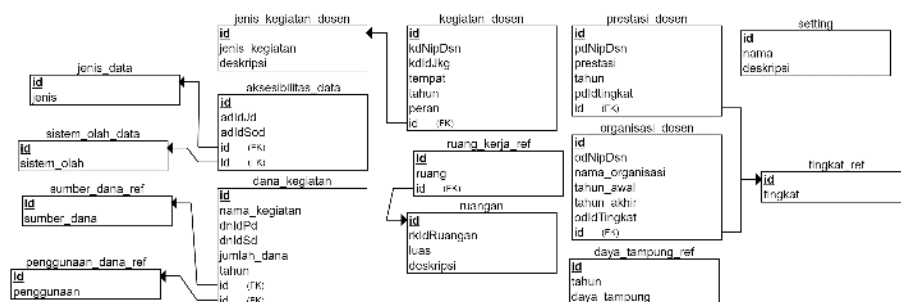


Figure 3. EIS database relation scheme.

3.3.2. *How (process)*. This column describes the design of data flow diagrams that will run using Data Flow Diagrams (DFD) on EIS.

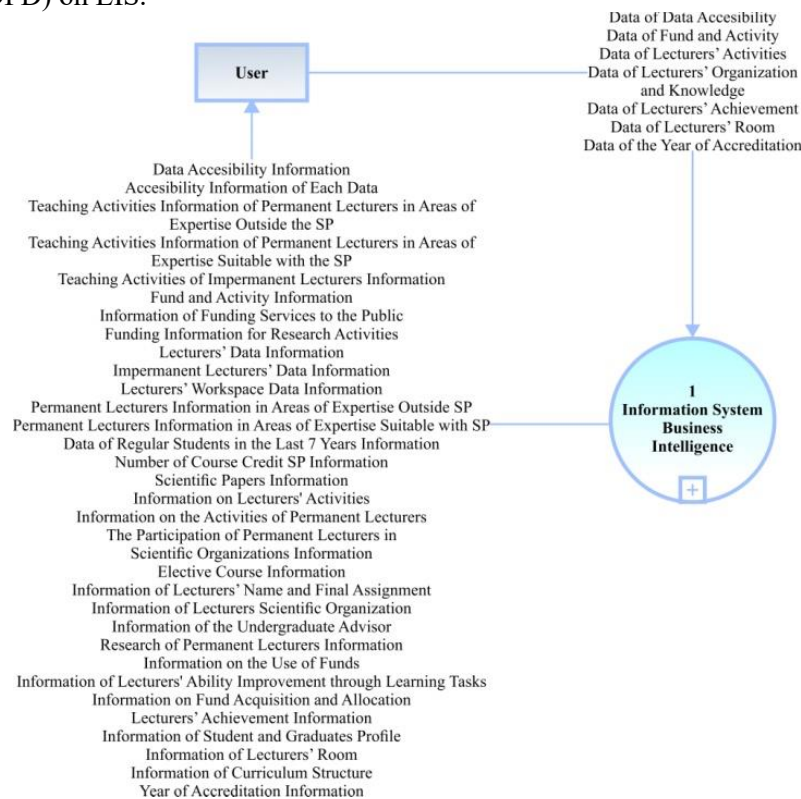


Figure 4. Context diagram.

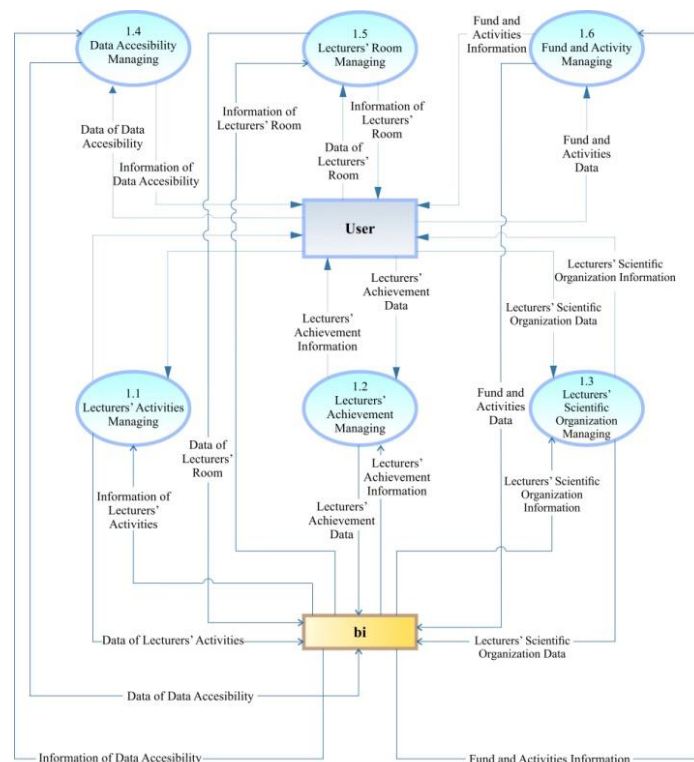


Figure 5. Data flow diagram.

3.3.3. *Who (people)*. This column will design the interface manual (mockup) of the EIS.

3.3.4. *When (time)*. This column discusses the schedule of activities for the analysis and design of the information system to be created. Here is a picture of the time schedule in the designer perspective.

No	Event	July				Aug
		1	2	3	4	1
1	Entity Determining					
2	ERD Designing					
3	DFD Designing					
4	Data Dictionary Designing					
5	Database Designing					
6	Interface Designing					

Figure 6. Time schedule process designer.

3.4. *Perspective builder*

This section defines the technology by compiling a physical data model that supports the initial design of the information system.

3.4.1. *What (data)*. This column will discuss the design of interrelated relation between tables and adapted to the database technology used in accordance with Figure 3, Figure 4, and Figure 5.

3.4.2. *How (process)*. This column will define the design of a technical process by describing the need to use a data dictionary.

3.4.3. *Who (people)*. In this column will describe the interface or interface picture of EIS. In this column will discuss the schedule of the application design that starts from creating a database to the creation of program code.

No	Event	August			September			
		2	3	4	1	2	3	4
1	Database Creation							
2	Interface design							
3	Coding							

Figure 7. Time schedule perspective builder.

3.5. *Perspective detailed representation*

In this point of view will illustrate the detail of the part responsible for processing the information system to be the final product and database scheme used by the developer to build the system.

3.5.1. *What (data)*. In this column will be discussed about the script in the manufacture of tables of data used.

3.5.2. *How (process)*. Data retrieval in EIS explained by following flowchart (Figure 10). Flowchart is divided into 3 namely flowchart about export data, manage data and change the year of accreditation.

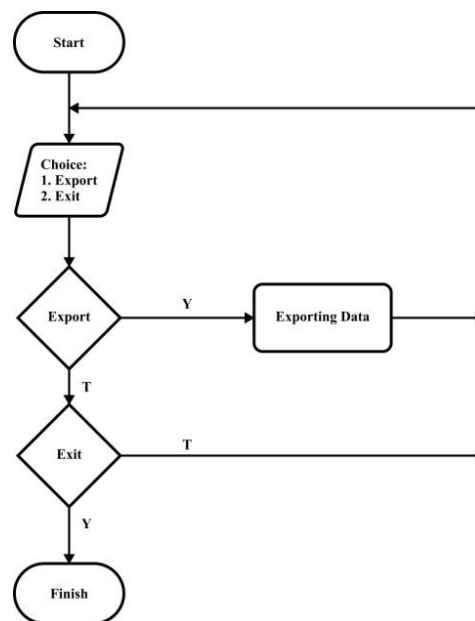


Figure 8. Flowchart export data.

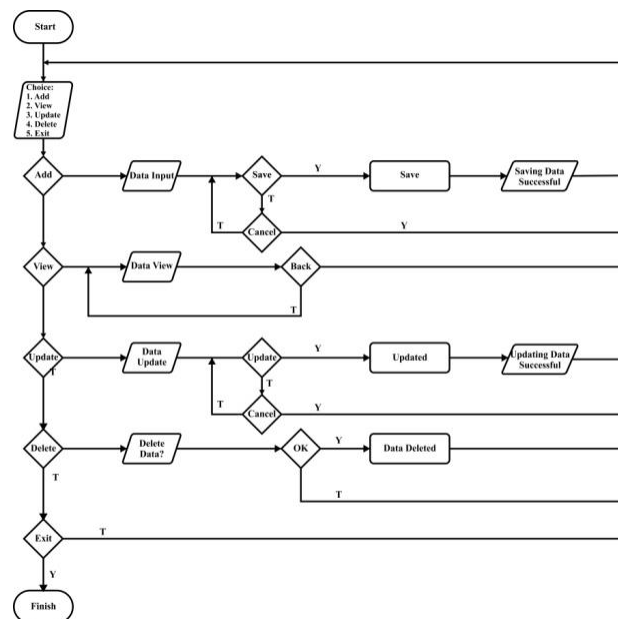


Figure 9. Flowchart manage data.

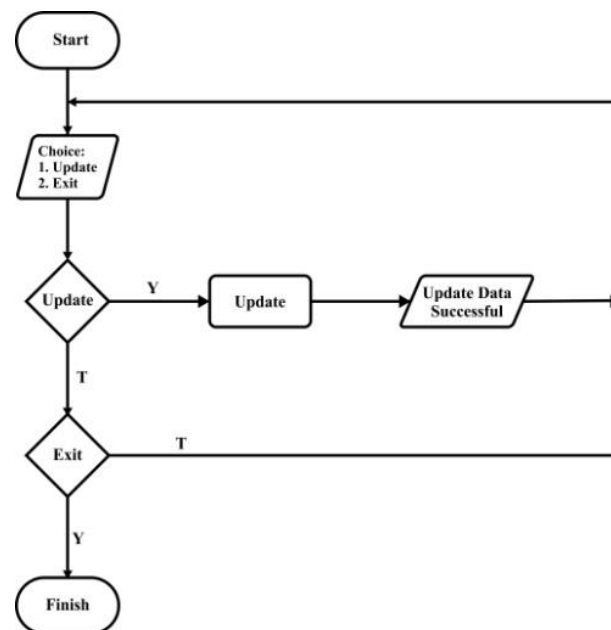


Figure 10. Flowchart change accreditation year.

3.5.3. *Who (people)*. This column will explain the permissions of the EIS. For the right of access from this information system, the chairman of the State Islamic University of Sunan Gunung Djati Bandung can perform all existing processes in this information system without any restricted because it acts as admin.

3.5.4. *When (time)*. In this column will be discussed about the time required in the process of coding or coding. The time spent in this coding or coding process is 4 weeks. Starting from the 3rd and 4th weeks of September to the 2nd week of October.

3.6. *Perspective function enterprise*

At this point of view will illustrate the details of the functions and detailed explanations of the EIS to make it easier for users and managers to run the system.

3.6.1. *What (data)*. In this column generate the data design or sample data used into the table that has been created.

3.6.2. *How (process)*. In this column will explain the tutorial use of this information system to the main process that exists.

3.6.3. *Who (people)*. In this column discusses who are users who use this information system.

Table 2. Entity list.

Nama User	Username	Level
Ketua Jurusan	admin	admin

3.6.4. *When (time)*. In this column discusses the schedule of design process, design and system implementation.

No	Activity Plan	Output Target	June				July				August				September				October			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Plan and Design System	Zachman Analysis and Application																				
		System Design																				
		a. Entity Determining																				
		b. ERD Designing																				
		c. DFD Designing																				
		d. Data Dictionary Design																				
		e. Database Designing																				
		f. Interface Designing																				
		System Design																				
		Database Creation																				
2	Implementation	Interface Design																				
		Coding																				
		System Implementation																				

Figure 11. Time schedule perspective function enterprise.

4. Conclusions and suggestions

4.1. Conclusions

Based on the research that has been done, it can be concluded as follows:

- EIS can run optimally by considering several perspectives, namely perspective planner, perspective owner, perspective designer and perspective builder.
- Comprehensive data requirements and integrated systems is a must for obtaining valid information based on campus needs.

4.2. Suggestions

The suggestions to consider for future research development, among others:

- To get a broader picture of the system, further research should include analysis and implementation of the column where and why.
- System development can be seen through Perspective Owner for system development does not deviate from existing system.
- Staging data is needed for emergencies situation and securities aspect during SIAKAD and Registration process.

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