Analysis of higher education executive information system in Indonesia

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Abstract. The purpose of this study is to analyse the Executive Information System (EIS) that suit the needs of the executive level in higher education. The FAST method used to achieve the goal. This study focuses on the analysis phase in Manado state university, Indonesia. The final result of this study is an EIS process model that will use for designing a web-based application that providing flexible facilities for executive (Rector) in accessing external and internal information that is useful to identify problems in internal decision making.

1. Introduction

Implementation of information and communication technologies (ICT) in the organization is mandatory in this era, in order to win competition [1]. The recent study talks about the information system as a weapon, so a specific application should be developed [2].

An Executive Information System (EIS) is a type of management information system designed to facilitate and support senior executives' information and decision-making needs by providing easy access to both internal and external information relevant to the organization's strategic goals [3]. Recent studies talk about EIS benefit, such as presenting information faster and efficiently [4], can help executives to get relevant information more efficiently [5], also could improve decision making [6].

This study aims to establish an EIS model adapted to the needs of executives in higher education in Indonesia. Although there are many pieces of research about the Executive Information System in the organization, this area is very young in comparison to the implementation in higher education, especially for Indonesia.

2. Method

This study is using FAST analysis approach; the acronym's letters stand for Framework for the Application of Systems Thinking [7]. That is a hypothetical methodology demonstrates a representative system development process. Unlike many commercial methodologies, FAST is not prescriptive that is flexible enough to provide for different types of projects and strategies. It advocates a balance between the value of documentation and the effort to produce it.

FAST, like most methodologies, consists of phases. The FAST employs eight phases to define periodic milestones and the deliverables. The table 1 below compares the FAST phases to the classic phases. Shown both sets of phases cover the same ground, but FAST phases are a more detailed then
classic one. Figure 1 shows the FAST methodology phases. Each phase produces deliverables that passed to the next phase also documentation accumulates as each phase complete.

**Table 1. Comparisons of FAST phases and classic phases.**

| FAST Phases             | Classic Phases                                      |
|-------------------------|-----------------------------------------------------|
|                         | Project Initiation | System Analysis | System Design | System Implementation |
| Scope definition        | ✓                      | ✓               | ✓             | ✓                     |
| Problem analysis        | ✓                      |                 |               | ✓                     |
| Requirements analysis   | ✓                      |                 |               |                       |
| Logical design          | ✓                      |                 |               | ✓                     |
| Decision analysis       | ✓                      |                 |               |                       |
| Physical design and integration |             |                 |               | ✓                     |
| Construction and testing| ✓                      |               |               | ✓                     |
| Installation and delivery|                        |                 |               | ✓                     |

**Figure 1.** Process view of system development [7].

As explained above, the FAST model covers system analysis that consists of scope definition to survey and plan system scope, problem analysis to study the existing system and similar ones, requirements analysis to define the requirements for the new system and logical design to verify the requirements. The system analysis model that used is model-driven analysis. Structured analysis that carried out focuses on examining the processes which are used by the system to model business requirements.
Models include processes, inputs, outputs, and files such as a data flow diagram. The model describes how the system responds to various actions.

3. Results and discussion

3.1. Scope definition to survey and plan system scope
As a part of project scope, project planning involving the determination and documentation of a list of specific project goals, outcomes, features, functions, tasks, deadlines, and ultimately costs. These are what needs to achieve; in other words, work that needs to be done to deliver a project. It is crucial to pin down the scope early in a project life cycle as it can significantly impact the schedule or cost (or both) of the project down the track.

In order to define scope correctly, some key processes followed: (a) Define the system requirements, before determining what will be in the project scope, must be very clear about what are the EIS requirements. (b) Define the requirements of the process; process requirements describe how people interact with the EIS and how the EIS interacts with other processes. (c) Engage the right stakeholders. At different stages of the project scope, the right stakeholders from the higher education executive must be very intimately involved. If this does not happen, assumptions start to make, and confusion of stakeholders can occur as the project continues. (d) Identify the limitations, maybe even more critical for a project than what is in-scope is what is out-of-scope. Undocumented is often crucial; otherwise, people will assume that certain things that have not been budgeted for or included in the timeline of the project to executed. (e) Change Management. In order to avoid disagreements and changes to a project scope by all stakeholders, both user-side and development-side, it is best to have strict change management processes in place. Once the scope is defined, it must be unchanged without the appropriate change management functions taking place, at which point appropriate action can be taken to address the shifting project requirements [8].

Also, effective scope management ultimately requires excellent communication to ensure that everyone understands the project’s requirements and agrees precisely how the goals of the project are [9,10].

3.2. Problem Analysis to study the existing system and similar ones
Analysis of problems can be used to analyze an existing situation, understand the problems that prevent the progress of the organization and generate a range of possible opportunities for improvement [7]. It can also be used to evaluate and explore an opportunity and identify the potential benefits of seizing it. This phase studies the existing system and analyzes the findings to provide more understanding of the problems that triggered the project. The deliverable of the problem analysis does not define inputs, outputs, or processes. Instead, they define the business criteria on which any new system will evaluate.

The figure 2 shows the development program target in higher education that parallel with Indonesia higher education development plan as necessary information criteria that will show in the new system. That is consist of student and learning, institutional quality improvement, improving the quality of resources program, research and development strengthening, innovation strengthening, management support and implementation of technical tasks, also monitoring and improvement of apparatus accountability.

3.3. Requirements analysis to define the requirements for the new system
The requirements analysis phase defines and prioritizes the business requirements, to find on what the need or what out of the new system. The business requirements consist of business data requirements, business process requirements, and business system interface requirements [7].

This study used data flow diagram (DFD) to maps the flow of information in order to describes process and data requirements. A data flow diagram (DFD) maps the flow of information [11]. It uses symbols defined to display data inputs, outputs, storage points, and routes between destinations. For define EIS requirements, illustrated by figure 3 process and input data need. In figure 4, what input data, the process was, and the output data information received.
Figure 2. Target of development program in higher education.

Figure 3. Current business processes.
3.4. Logical design to verify the requirements
Logical design is the translation of business user requirements into a system model that shows only business requirements and not any technical design possibilities—called conceptual design or abstract design [7]. This study used the CRUD matrix to model the logical design. CRUD is Create, Read, Update and Delete [12]. The matrix describes the user authority in a new system and information need in the dashboard.
Table 2. CRUD matrix for the EIS system.

| Executives | Student and Learning program | Institutional improvement program | Improving the quality of resources programs | Research & development strengthening programs | Innovation strengthening programs | Management support programs & implementation of technical tasks | Monitoring program & improvement of accountability & accountability
|-------------|-----------------------------|-----------------------------------|---------------------------------------------|-----------------------------------------------|--------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| Rector      | Target                       | Achievements                      | Target                                      | Target                                        | Target                         | Target                                             | Target                                             |
| Vice rector 1 | CRUD                        | R                                 | U                                           | R                                            | R                             | R                                                  | R                                                  |
| Vice rector 2 | CRUD                        | RU                                | CRUD R                                      | RU                                           | RU                            | RU CRUD                                           | RU CRUD                                           |
| Vice rector 3 | CRUD                        | CRUD                             | R                                           | CRUD R                                       | CRUD                          | CRUD CRUD                                         | CRUD CRUD                                         |
| Vice rector 4 | CRUD                        |                                    | CRUD                                        | CRUD                                         | CRUD                          | CRUD CRUD                                         | CRUD CRUD                                         |
| Head of Research Department | CRUD         | RU                                | CRUD                                        | RU                                           | RU                            | RU CRUD                                           | RU CRUD                                           |
| Dean        | RU                          | CRUD                             | RU                                          | CRUD                                         | RU                            | RU CRUD                                           | RU CRUD                                           |
| Head of study program | CRUD | U                                 | U                                           | U                                            | U                             | U                                                 | U                                                 |
| LP2AI       | RU                          | CRUD                             | RU                                          | CRUD                                         | RU                            | RU CRUD                                           | RU CRUD                                           |

4. Conclusion

The model that we propose provide an easy and quick access to internal information regarding to strategic planning in managing higher education. These results could contribute to define the types of information most frequently contained in EIS for higher education in Indonesia. In other hand EIS implementation should consider of these things such as: developing an EIS must trustable in providing accurate information, must follow rapidly changing of hardware and software technology and need another support of information system thus, an integrated system with other information system could contribute trustable information results.

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References

[1] Seo H J, Lee Y S, Hur J J, Kim J K 2012 The impact of information and communication technology on skilled labor and organization types Inf Syst Front
[2] Ives B, Learmonth G P 1984 The information system as a competitive weapon Commun ACM
[3] McLeod R 2003 Executive Information Systems Encyclopedia of Information Systems
[4] Rainer R K, Watson H J 1995 The keys to executive information system success J Manag Inf Syst.
[5] Giner J L C, Fernandez V, Boladeras M D 2009 Framework for the analysis of executive information systems based on the perceived usefulness and the perceived ease of use Intang Cap
[6] Leidner D E, Elam J J 2008 The Impact of Executive Information Systems on Organizational Design, Intelligence, and Decision Making Organ Sci.

[7] Whitten J L, Bentley L D 2007 Systems Analysis and Design Methods McGraw-Hill

[8] White J M 2014 Defining the Project Scope In: Security Risk Assessment

[9] Lankhorst M 2012 Stakeholder Communication. In: Agile Service Development [Online] Retrieved from: http://www.ncbi.nlm.nih.gov/pubmed/22928395?%5Chttp://www.springerlink.com/index/10.1007/978-3-642-28188-4

[10] Rantung V P, Kainde Q C 2016 Database design for agile stakeholder communication Proceeding of 2015 1st International Conference on Wireless and Telematics, ICWT 2015

[11] Baldwin A N, Austin S A, Hassan T M, Thorpe A 1999 Modelling information flow during the conceptual and schematic stages of building design Constr Manag Econ

[12] Murray M 2010 Database Security: What Students Need to Know J Inf Technolgy Educ.