Modeling Of Enterprise Information System Architecture Planning In Private Universities In Indonesia

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In strategic planning SI / IT is needed an enterprise architecture (EA) in order to achieve the alignment of SI / IT strategy with the business strategy of the organization. EA is seen as a logical, comprehensive, and holistic approach to define, design and implement system systems and components simultaneously. Data collection by interview, documentation, questionnaire, and direct observation of organization. The analysis used Value Chain, SWOT, PEST, Porters Five Force, and Critical Success Factor (CSF) method is a complete method or framework in designing an architectural enterprise, but it is necessary to understand each step in the methodology so that it can Translated and adapted for the needs of the organization. The expected result of this study is a form or formula for SI / IT strategic planning that is adapted to the business processes and requirements of the private University in Indonesia in designing the architectural enterprise for SI / IT strategic planning.

Keywords: Strategic Plan SI / IT, Enterprise Architecture

INTRODUCTION

Private Universities In Indonesia are looking to build an information system to support business functions. Nevertheless, the tendency to use Information Technology to build information systems at the Private Universities in Indonesia is still inclined to overlap and overlap just to meet the need for a momentary function. This situation will make the use of Information Technology at Private Universities In Indonesia become less optimal both from its support and the financial side. Based on these conditions it would be better if the use of Information Technology at Private Universities In Indonesia has a good, intact, and thorough planning [9].

Information systems play an important role in an organization, both for management in decision making and for the user in running the company's operations. An information system is created so that the organization's goals can be achieved optimally. However, many organizations use information systems with regard to temporary needs and are not well integrated. Therefore, it complicates the user in carrying out business processes within the company.[10]

A good information system should be made based on the proper planning in accordance with the user's needs and organizational goals. The creation of an inefficient and well-managed information system can result in inaccurate information, thereby enabling the occurrence of errors in decision making. [11]

Enterprise architecture is a modern approach to planning data quality to achieve SI mission. Enterprise architecture is also a process defines a number of architectures that are: data architecture, application architecture, and technology architecture in using information to support businesses to align business strategies with IT strategies where in the development of an organization's business strategy will be the first step in determining future IT strategies. Enterprise architecture will provide maps from the enterprise and is a planning center for business and technology changes. The link between existing architecture is important for Enterprise architecture. Because Enterprise architecture is not developed marginalized, Enterprise architecture should look in the enterprise's broad perspective. [12]

Private Universities In Indonesia that utilize the role of information technology in its organizational operations. For the achievement of the vision and mission of the University, the role and SI / IT are required, so the utilization and infrastructure of SI / IT become a tool that can be used as a process and strategy to achieve goals, achievement of vision and mission and to run Tridharma University, It would be better if the use of Information Technology at Private Universities in Indonesia has a good, intact, and comprehensive planning. [4]

METHODOLOGY

Enterprise Architecture is a logical organization of key business processes and Information Technology (IT) capabilities that reflect the integration requirements and

standards of the company's operating model according to Center for Information Systems Research [10]. Enterprise Architecture is a set of principles, methods, and models used in the planning and realization of an organizational structure of business, business processes, information systems and infrastructure [9]. Based on the description above, it can be concluded that enterprise architecture is the principles, methods, and models used in designing and realization of a company's organizational structure, business processes, information systems and infrastructure. EnterpriseArchitecture Planning is an architecture-defining process for information use in business support and planning to implement the architecture [3].

The Enterprise Architecture Planning methodology and model is the earliest part of the key part of Enterprise Architecture's most relevant knowledge and has greatly influenced the framework, methodology and best practices in the public and private sectors [4]. In this journal the research methodology used is adapted with the architectural modeling steps that exist in the EAP, namely:

A. The start of planning
B. Business modeling
C. Current system and technology architecture
D. The development of enterprise architecture model
1) Data architecture
2) Application Architecture
3) Technological architecture
4) Implementation

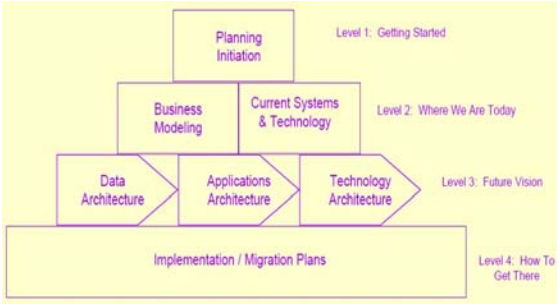

Figure 1. Enterprise Architecture Planning Stages

RESULT AND DISCUSSION

The EAP phase involves six cells, each of which is constructed through four levels - the level to start, the stage for understanding the current situation, the stage of defining the vision of the future and the stage for drafting future vision plans. The EAP stages can be illustrated in the chart level:

First layer 1
This layer is the beginning of the planning consisting of the methodology used, who will be involved, and the tools to be used. The outcome of this stage is the work plan for enterprise architecture planning and management commitment to continue to the next six levels. At this stage, an EAP working frame includes time and resources, creating a team and project scheduling

Layer 2 Understanding the current state
This layer is used to model a business. This course combines and builds a knowledge base on the business and information the current business uses. This chapter defines the existing application systems and technology platforms to support current business. The result is in the form of inventory of data application system and technology platform that will be used. At this stage, field survey is to inventory process process in academic system. It also determines the business model of the system. This graduates also defined the technology platforms currently used by the academic system.

Layer 3 Plans for the future
This stage defines data architecture, application architecture and technology architecture. The data architecture describes the major types of data required for the business. Application architecture defines the types of applications needed to manage data and support business fungi. The technology architecture defines a network that supports the academic system.
The arrows on this layer mean that the data architecture is defined before, then the definition of app architecture, and lastly is the technology architecture.
Layer 4 Achievement strategy
This layer is used as Implementation or migration plan. This module defines the sequence for application implementation, schedule for implementation, cost analysis and benefits, and recommends the route for migration from the current state to the desired state.

Following the steps in the EAP concept will be used to model the academic information system at the University in general. The results of each of these steps are as follows:

1. Start of Planning

The initial stage of EAP is the design control, which defines the organization as an object by outlining the organization's vision and mission associated with the vision of information system planning so that architectural development can be done in line with business objectives. In line with its well being as a University, core business from the University consists of 3 main components: education and teaching, community service, and a study called the tri dharma University. By providing educational services to the public to produce graduates who will be deployed back to the community. Determining vision and mission is essential as a guide to determine the various IT strategies needed to support the vision and mission. The selection of the design methodology approach will determine the outcome of the blueprint to be made.

2. Business modeling

The organizational structure within the University has become a key basis for doing business modeling. The organizational structure will show what part will be controlled by a University. So the determination of the organizational structure will be crucial in the business modeling step. Based on the value chain concept, the main functional areas for the university education model

can generally be grouped into the main activities and support activities. The main activities consist of student acceptance, academic operations and graduation. While support activities consist of activities related to resource management (general), financial management, planning and information systems, and publications and publications. Figure 2, shows the value chain for a university education and research model.

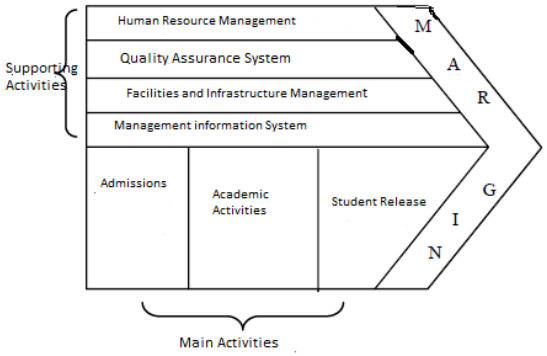

Figure 2. University value chain

Value-added chain Porter helps enterprise management to segment organizational policy activities into key activities and supporters.
Its main activities include Master's Reception, Academic Operations, and Graduation. Supporting activities are activities that support key activities and include general, financial / personnel, planning and information systems, and publications and publications. Identifying these activities will help the enterprise to focus on the area of the activity thus adding more value to the products and services. Margin intended at the above value added chain Porter is to ensure that the key activities of the enterprise are more effective, efficient, confidential, integrity, availability, compliance, Rules or operating standards available), and reliability (assured of reliability).

3. Current Systems and Technologies
At this point, describe the processes that support the business. This process is illustrated in the form of matrices such as process vs organizational matrix, system vs. organizational matrix, process vs. system matrix vs. system class vs matrix

4. Data Architecture
In the development of architectural models, the first thing to do is to create data architecture. The data architecture that will be defined this time is the definition of data usage that will be applied to the later application architecture, which will be presented at this stage according to the EAP stage in data architecture is: entity candidates, application architecture and technology architecture

Application Portfolio
One of the parameters in determining implementation plan priority is to create applications that create data more than data-driven applications. However, there are some other considerations in determining the implementation plan. John Ward and Joe Peppard propose an approach to aligning IT / SI investments and business strategies. The proposal in the form of application grouping into four types, namely strategic, high potential, key operational, and support

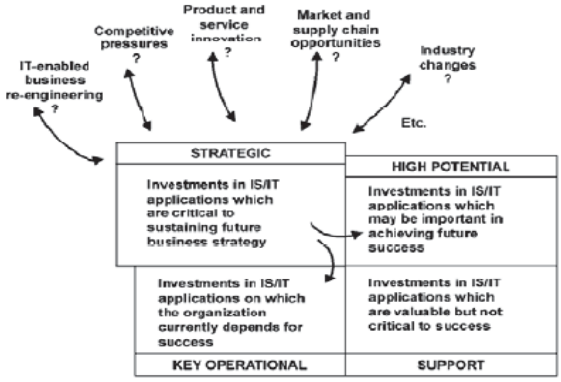

Figure 3. App Portfolio from a strategic point of view

1. Strategic: In-app investment is very important to maintain business strategy in the future
2. High Potential: an in-app investment that may be important in achieving future success.
3. Key Operational: In-app investment where the success of the organization today depends heavily on the application.
4. Support: valuable in-app investment but not too successful.

Applications that fall under the Key Operational and Strategic categories should be the main priority to be implemented.

1. Implementation plan
The purpose of the implementation plan is to formulate and prepare plans to implement the built-in architecture, in this case the data architecture, application architecture, and technology architecture. The implementation plan is the final step to be taken in EAP design.

2. Implementation
The stage of implementation of blueprint is based on the EAP method comprising business model, current system and technology analysis, data architecture, application architecture, and technology architecture.

3. Business Modeling With Value Chain Analysis
In this case, the analysis of business function list is done by using the value chain method. The steps are:
• identifying processes related to the academic system;
• identifying the product and its flow in the organization;
• identifying resources related processes

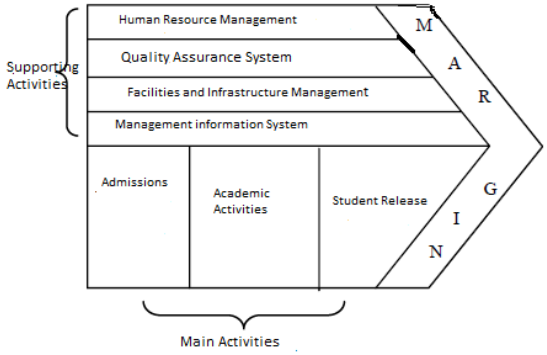

Figure 4. Business Functional Modeling
Private Universities In Indonesia

Each of the main activities can be described as follows:
1. Function name: Student acceptance
   Description: New student admission activities start from basic determination to new student enrollment.
2. Function Name: Academic Activity
   Description: Academic activities aimed at students since enrollment until graduation.
3. Function Name: Student Release
   Description: Activities related to the graduation process of Telkom Polytechnic students.

Supporting activities can be described as below:
1. Function Name: Financial Management
   Description: Financial management activities
2. Function Name: Human Resource Management
   Description: Determining the needs and provisions of human resources.
3. Function Name: Logistics Management
   Description: The activities of the management of goods and services which include activities that start from designintheir
   existence to removal

Functional Hierarchy

After defining the existing value chain, the next thing that is done is to structure the decomposition structure of the main and supporters. Function hierarchy chart describing the decomposition structure, Needs of application support for functionality, and the availability of the current application is broadly as follows:
1. New Student Admission
2. Academic Activities
3. Student Release
4. Human Resource Management
5. Quality Assurance System
6. Management of facilities and infrastructure
7. Management Information System

Swot Analysis

To determine the strategy of achieving the mission vision of Private Universities In Indonesia, analysis of the strengths, weaknesses of the internal environment and the analysis of opportunities and external threats of the organization.

Table 1. Swot analysis

	SWOT Strategy	Information Needs	Strategies SI / IT
1.	Create specialized education programs (such as nightclubs, weekend classes, etc) in improving the services of private universities in Indonesia	Informed information, information facilities and infrastructure, private University information in Indonesia	Website
2.	Increase human resources competency, especially through trainers as well as S2 and S3 schools for lecturers	Officer data information, employee performance evaluation results, training requirements information, performance assessment results after training	SI Staffing
3.	Implement training and workshop on ICT development especially for University	Employee data, employee performance appraisal, training requirements information, performance assessment results after training	SI Staffing
4.	Make expert recruitment with a special Buddhist education.	Job information, information on manpower requirements	*E-recruitment*
5.	Collaboration with University institutions in Indonesia and Overseas to obtain new prospective students	Informational information, supporting information and infrastructure, University information	*Website*
6.	Establish a good relationship with TELKOM in order to do the telephone network installation on the path	New phone installation and installation information	
7.	Collaborate with local libraries and central libraries in the acquisition of library books and / or access to the central library for students with higher education	New book information, library book collection information	*E-library*
8.	Collaborate with SMA-SMA in promoting to get new prospective students	Informational information, supporting information and infrastructure, University information	*Website*
9.	Promote academic products offline or online.	Informational information, supporting information and infrastructure,	*Website*

		University information	

External Organizational Environmental Analysis with PEST analysis (Political, Economic, Social, Technology)

Table. 2. PEST (Politics, Economics, Social, Technology)

Analisis	Kebutuhan	Strategi SI/TI
Political	Officer data, assessment, study task	SI Staffing
Economics	student information	Academic SI
Social	Alumni information, the distribution of the working world	SI Alumni
Technology	Infrastructure, academic information, social networking facilities	Website, Online Sharing, Hotspot

Organizational External Environmental Analysis with Five Porter's (Porter's Five Force) analysis

Table. 3 .Five Porter Power

Existing Competitor (Current Competitor)	1.	Gift of laptop and mobile gift for prospective freshman who enrolled.
	2.	Improved service quality and graduates.
	3.	50% tuition deduction for top 3 student candidates.
	Strategy	
	1.	Granting discounts and tuition discounts
New Immigrant Factor	1.	Complete campus facilities.
	2.	Offers a fast lecture system completed within 3 years and earned a degree from within and outside the country (double degree).
	3	Offering guarantees for students who have completed the study.
	4	Offers better facilities and infrastructure
	5	Better welfare offer to Human Resources in order not to move workplace
	Strategy	
	1.	Completeness of facilities, both main and support facilities
	2.	Policies to provide employees welfare.
Product and service factors (Substitute Product and Service)	1.	The number of training institutions that offer short courses or training software that is commonly used in the world of work
	2.	The existence of a threat in the form of assumption to the public that follow the education program at the level of the course is sufficient compared to high school or university level education
	Strategy	
	1.	Provide additional materials, extracurriculars, and trainings
	2.	SI info work world (SI graduates)
Bargaining Power of Customer	1	Most of the students who have worked to ask for leniency on the lecturers who teach the courses to be able to enter in 10 to 20 minutes late from normal hours
	2	Most of the students who work with shifts will ask for permission not to attend the lecturers who teach the course and ask for additional duty beyond the task given to the other students
	3	More choices about majors
	Strategy	
	1	Academic management
	2	The existence of new learning methods as an alternative face to face (website, online sharing).

Bargaining Power of Supplies	1	Working closely with book publishers or hardware and software providers to purchase in bulk to get a cheaper price.
	2	Prospective students compare existing facilities with other universities
	Strategy	
	1	Improvement of infrastructure

Enterprise Survey

Table. 4. **Enterprise Survey**

No	Organization Sub	Division of Business	Function
1	Academic	- academic - Student Affairs - Alumni	PMB PPM OA
2	Academic, student and general administration	- Planning - Finance - General	USP SDM, KA SP
3	Department and Prodi	- Advisory Lecturer - Lecturer Group	OA, PA
4	Technical implementation Unit	- Research - Library - Computers - Laboratory	UPT

Data Architecture

a. List of candidate entities

The entity candidate is an entity that will be part of the enterprise architecture plan, so the determination can be based on the condition of the main business function on the pre-defined value chain, thus the entity to be defined is the business entity and based on the business entity will define the data entity. In accordance with the conditions of the value chain, the list of business entities and data contained in table 1 that can be identified is as follows:

Table 4. Entity List

Business Entity Data Entity	Data Entity
Entity Admissions	1. Entity of PMB Committee 2. Entity Problem PMB Exam 3. Member of PMB Participant 4. Selection Type Entity 5. Student Entity Candidate
Academic Activities Entity	6. Student Entity 7. Lecturer Entity 8. Entity Subject 9. Registration Entity 10. Class Entities 11. Departmental Entity 12. Space Entity Lecture 13. Cost Entity 14. Entity Lecture Schedule 15. Payment Proof Entity 16. Curriculum Entity 17. Entity List of Lecture Present 18. Entity List Attending Teaching Lecturer 19. Value Entity 20. Academic Calendar Entity 21. Trusteeship Entity
Student Release Entity	22. Alumni Entity 23. Stake Holder Entity
Human Resource Management Entity	24. Budget Entity 25. Realized Entities 26. Employee Entity 27. Estimated Entities 28. Revenue Entity 29. Expenditure Entity 30. Prospective Employee Entity 31. Salaries 32. Employee Achievement Entity
Quality Assurance Entity	33. 33. Journal Entity 34. Bulletin Entities 36. Book Entity Aja
Facility Management of Facilities and Infrastructure	37. 37. Facilities and Infrastructure Entities 38. Inventory Entity 39. Procurement Entity 40. Assets Monitoring Entity
Management Information System Entity	41. 41. Laboratory Entities 42. Software Entity 43. Information System Entity

Application Architecture

After defining the data architecture, it will then proceed into the application architecture definition. Application

architecture to be identified is to assist the main business functions of the organization. Things to do to determine which apps are required by the organization. Application architecture related to the field of education in the University is generally shown in Table 5.

Table 5. Application Architecture

Application System	Application Group
Entrance Selection Test System	Application for New Student Registration Test Result Management Application New Student Registration Application
Academic Operational System	dent Administration App Re-Enrollment App Application of Study Plan Administration Curriculum Management System Student Payment System Trust System Lecturing Scheduling System Application of KRS and KTM Application of Study Plan Changes Lecture Administration System Scheduling System and Test Administration Scoring system Application of Seminar Administration and Comprehensive Exam Academic Reporting System
System Administration Disclosure	Graduation Enrollment System Alumni Management System System of Transcript Making and Diploma
Academic	Asset Data Collection System Asset Lending System Asset Maintenance and Removal Systems
Asses and Inventory Systems	Recruitment System Employee Spending System Employee Administration System Education Management System and Training Leave Management System Administration System of Honor and Salary Calculation Budget System Accounting System
Laboratory Administration System	Laboratory inventory system Laboratory scheduling system
Publishing System and Publication	ournal data collection system and bulletin Online search system and online bulletin

Architecture of technology

Technological principles and platforms are created to identify the type of major technology platforms needed to support shared data environments and applications at the University. This principle is determined by considering the trends and development of information technology, business model, data architecture, application architecture, systems and technology as well as the demand and findings of business actors within the organization. In table 3 will be shown a technology platform that can be used to support data and applications at the University.

Table 6. Technology Architecture

Area Principle	Description
Operating system	1. The operating system used supports the organization network. 2. The selected operating system is portable (run on multiple platforms), scalable (can run on small to large-scale computers, interoperable (compatible in heterogeneous environments), compatible (maintaining existing software investments and allowing technological advancements to be applied On existing components) 3. The operating system supports a number of software and applications as well as system development tools
Hardware	1. The hardware must be reliable and have a high level of availability and support of upcoming technology. 2. Selection of hardware technology is not based on certain technology features and does not focus on a brand. 3. Enterprise hardware must have a high level of service and utilization
Communication and	1. Network capacity provides bandwidth for future development and a variety of data formats. 2. The network environment is provided with sufficient bandwidth and a set of standard protocols to support network services and realtime access to information. 3. All physical locations within the enterprise will be connected to the network

	backbone. Interconnection rates and capacities are determined by location 4. All components utilized in the enterprise network infrastructure must be adequate and can be upgraded and authorized and management is done centrally. 5. All network infrastructure equipment must have the ability to obtain and record network performance statistics. 6. Computer network system and data communications, can be utilized further to conduct voice communications (voice) with the transmission of sound waves through digital means.
Network	1. Documentation of all apps created and managed 2. Procurement of applications is preferred through self-development before considering to purchase. 3. The entire design of the application should be modular and should be testable. 4. Perform configuration management of the application to handle any change and upgrade effort through version control
Application	1. Data is separated from application 2. Data is the enterprise resource and is not owned by a particular unit. 3. Data is captured once from the source and used as needed 4. Data access is free of location and physical structure in user's view 5. Data is administrated centrally and managed for ease of access and embrace the concept of data warehouse. 6. The database model used is a relational database that is relatively easier to understand and more popular. 7. Information stored online is available on a continuous basis and updated on a regular basis as required. 8. Selection of DBMS tailored to the needs of enterprise
Management	1. Security policies and standards cover physical and electronic access. 2. Access to enterprise information resources will be centrally monitored by the unit associated with information technology. 3. Application and data authorizations can be assigned by the related unit. 4. Security needs include secrecy, availability (the need that information resources can only be obtained and used by eligible users) and integrity (the need for information resources can only be modified and maintained by related units). 5. The server infrastructure is supported by the ability to encode / encrypt important data and should be able to expand to other servers.

CONCLUSION AND FUTURE WORK

Conclusion

Based on the results of design and implementation then it can be concluded as follows:

1. The existence of Roadmap enterprise architecture planning can create a systematic system to facilitate the process of making and implementation of information systems.
2. Enterprise Architecture systematically and completely can produce Blueprint / Blueprint Information technology.
3. EAP produces integrated information system applications.
4. Enterprise information architecture will be a reference in short-term and long-term technology investment taking into account the overall interest.

Suggestion

The suggestions of this research are:

1. For further development is recommended using android technology.
2. It is recommended to perform user requirement software and software requirements specification module next.

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