



Information System Strategy Planning Using Enterprise Architecture Planning in College Libraries

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ABSTRACT

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The library of the National University of Jakarta currently records transactions manually, which makes the librarian's performance inefficient. Here, the researcher is trying to create information system planning that covers all perspectives of the organization and business with the help of the enterprise architecture planning (EAP) technique using the Zachman framework. The EAP model is limited to the main business area, the library sector, which creates the main activities and support activities according to Porter's value chain. Based on the business processes implemented by the library, EAP can show the design for an integrated architecture within the library information system, which includes business architecture, data architecture, application architecture, infrastructure architecture, and implementation plans to bring about changes for the better.

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1. Introduction

One of the components of education that plays a role in the success of the learning and educational phases is the library. This is because with the library, students can continuously educate themselves [1]. Library management can function well if it can present and utilize information technology developments to its members in terms of service efficiency [2].

Increasing data innovations bring influence and changes to various fields, including the use of data innovations in libraries. To face different challenges and changes, competent staff must be competitive in the globalization period. The library of National University of Jakarta is one of the libraries that has changed from manual advantages to computer use. The manual exchange takes a long time, so key settings for the information system are required. The goal is for the library to prepare a more viable trading system.

Based on the above, the researcher tries to create data from the library using EAP (Enterprise Architecture Planning) strategy using Zachman framework, which is then used to create key library data frameworks based on the vision, mission, goals and business methodology of the National University Library Jakarta.

To support EAP that helps translate business strategies for libraries, you can use Business System Planning (BSP) to make it an information systems planning strategy. BSP is used in defining the data architecture by translating the National University Library into a set of business processes that then identify the data elements needed for the National University Library's business activities.

1.1. Enterprise Architecture

Enterprise is a group of organizations with many common goals or principles and / or baselines [3]. Enterprise architecture is a logical, comprehensive and holistic approach to the simultaneous organization and implementation of systems and system components, including information technology management infrastructure [4].

Enterprise architecture is a master plan that acts as a collaborator in various aspects, including aspects of business planning such as goals, vision, mission, and principles of good governance. In supporting industrial business processes, a master plan can be helpful in planning organizational structures, industrial tasks, and activities on computer-based aspects such as information systems and databases, and technology infrastructure to support business such as computers, networks, and operating systems.



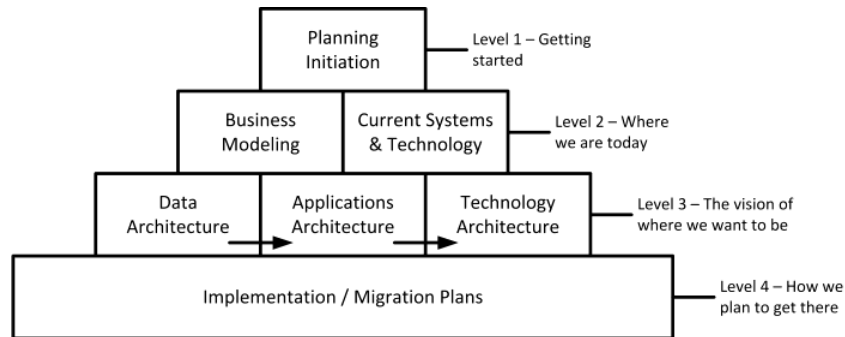


Fig 1.EAP layer [7]

1.2. Framework Zachman

Basically, the Zachman Venture Design System may be an arrangement for overseeing endeavor artifacts. The Zachman system comprises of six lines and six columns [9]. Zachman system components are shown as cells (see Fig underneath).

© 1986 - 2005 John A. Zachman, Zachman International

Zachman Framework

(used for its structured architecture artefacts taxonomy – Zachman grid)

	DATA what	FUNCT.how	NETWK. where	PEOPLE who	TIME when	MOTIV. why	
Scope contextual Planner view	List of Things important to the Business Entity = Class of Business Thing	List of Processes the Business Performs Process = Class of Business Process	List of Locations in which the Business Operates Node = Major Business Location	List of Organizations important to the Business People = Major Organization Unit	List of Events/Cycles significant to the Business Time = Major Business Event/Cycle	List of Business Goals/Strategies End/Means = Major Business Goal/Strategy	SCOPE (CONTEXTUAL) Planner
Business Model conceptual Owner view	e.g. Demands Model Ent = Business Entity Rel = Business Relationship	e.g. Business Process Model Proc = Business Process IO = Business Resource	e.g. Business Logistics System Node = Business Location Link = Business Linkage	e.g. Work Flow Model People = Organization Unit Work = Work Project	e.g. Master Schedule Time = Business Event Cycle = Business Cycle	e.g. Business Plan End = Business Objective Means = Business Strategy	BUSINESS MODEL (CONCEPTUAL) Owner
System Model logical Designer view	e.g. Logical Data Model Ent = Data Entity Rel = Data Relationship	e.g. Application Architecture Proc = Application Function IO = User View	e.g. Distributed System Architecture Node = IS Function (Processor, Storage, etc) Link = Line Characteristics	e.g. Human Interface Architecture People = Role Work = Deliverable	e.g. Processing Structure Time = System Event Cycle = Processing Cycle	e.g. Business Rule Model End = Structural Assertion Means = Action	SYSTEM MODEL (LOGICAL) Designer
Technology Model Physical Builder view	e.g. Physical Data Model Ent = Segment/Table/etc. Rel = Relationship/etc.	e.g. System Design Proc = Computer Function IO = Data Storage/etc.	e.g. Technology Architecture Node = Hardware/Software Link = Line Specifications	e.g. Presentation Architecture People = User Work = Screen Form/etc.	e.g. Control Structure Time = Execute Cycle = Component Cycle	e.g. Role Design End = Condition Means = Action	TECHNOLOGY MODEL (PHYSICAL) Builder
Detailed Representations Out-Of-Context Sub-Constructor view	e.g. Data Definition Ent = Field Rel = Address	e.g. Program Proc = Language Statement IO = Control Block	e.g. Network Architecture Node = Address Link = Protocol	e.g. Security Architecture People = Identity Work = Job	e.g. Timing Diagram Time = Interrupt Cycle = Machine Cycle	e.g. Role Specification End = Sub-condition Means = Step	DETAILED REPRESENTATIONS (OUT-OF-CONTEXT) Sub-CORPORATOR
Functioning enterprise User view	e.g. DATA 	e.g. FUNCTION 	e.g. NETWORK 	e.g. ORGANIZATION 	e.g. SCHEDULE 	e.g. STRATEGY 	FUNCTIONING ENTERPRISE

Fig 2. Zachman's framework

2. Method

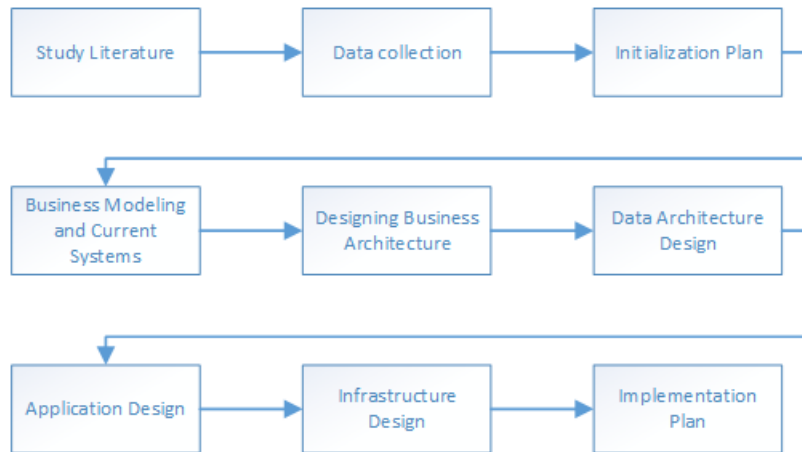


Fig 3. Research Flow

Fig 3 shows the stages used in the study. Based on the study literature, data collection was then conducted using observations and interviews. The study literature was conducted in several journals, which served as a reference source since it was assumed that it has something to do with the topic discussed. Observations were made through direct observation in Jakarta National University Library. Initialization plan by analyzing the current business modeling and systems using manual systems. Application of architecture itself consists of designing business architecture, designing data architecture, designing applications, designing infrastructure and finally implementation plan.

3. Result

3.1. Initialization plan and organizational analysis

a. Business modeling

In this phase, the researcher gathers all kinds of business-related knowledge and information to manage business continuity in an organization. In determining the main business areas, the researcher uses Porter's value chain concept. The purpose of using the value chain is to determine the types and activities that are included in the National University Library of Jakarta. In the value chain analysis, there are two activities, namely main activities and supporting activities, as shown in Fig 4.



Fig 4. The Library Value Chain of the National University of Jakarta



From this picture, it can be explained as follows:

1) Main Activities

- a) New member registration, an activity that begins the process from member registration to the formation of a library membership card.
- b) Adding library collections, activities where the process starts from purchasing library collections to numbering library collections to placing library collections according to the created collection numbers.
- c) Website creation and promotion on social media, activities where the process begins with designing and creating websites to facilitate librarian performance, and then creating various types of social media to support library activities and promotions.
- d) Library Collection Management, an activity where the process starts from inventory of library collections to collection reports for the needs of the Library Director, Vice Chancellor and Chancellor of the National University of Jakarta.
- e) Borrowing and returning books, activities in which the process from orders to borrow library collections by library members to return library collections by checking the condition of library collections or late returns so that library members are fined for damages to fines the library collection and late returns.

2) Support Activities

- a) Human Resources Management, an activity in which the processes that occur range from demand management, human resources assignment, hiring, monitoring, and evaluating fees, to reporting on human resources performance.
- b) Facilities and infrastructure management, activities in which the process involved ranges from managing requirements for facilities and infrastructure, to monitoring and evaluating, to reporting on facilities and infrastructure.
- c) Information technology management, an activity in which the processes occurring range from managing information technology requirements through monitoring and evaluation to reporting on information technology.

b. Current System

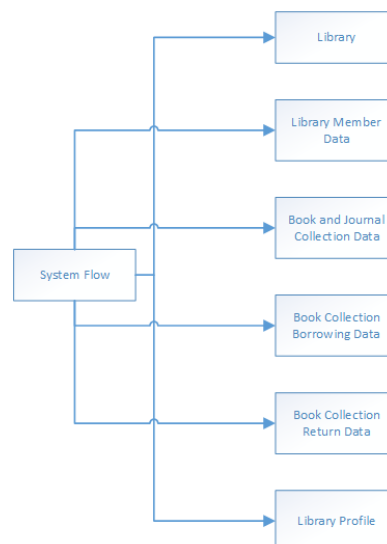


Fig 5. Current system flow

This phase aims to document and describe all system and technology platforms currently owned and used by the Jakarta National University Library. The Jakarta National University Library has used data technology to support its business processes, but not all activities use data systems.

The result of this phase is the IRC Knowledge Catalog (Information Resource Catalog), which can be described in a matrix style, namely:

- 1) Matrix of the relationship between applications and business functions

- 2) Matrix of relationship between tools used and technology, so you can see the business functions supported by technology applications.

3.2. Data Architecture Design

Data architecture is created to define the main elements used to support business functions in Jakarta National University Library. The data architecture must first define data elements, then create relationships between elements, and finally create a business process matrix for existing elements. Table 1 provides a breakdown of the business elements in the Jakarta National University Library.

Table 1.

Data Architecture	
Business Elements	Data Elements
Member Registration	Faculty elements Major element Biodata elements of students or lecturers
Book Collection	Publisher element Place of publication element Qualification element Subject elements Language Element
Borrowing Books	Library Member Element Book collection elements Borrow date element
Book return	Library Member Element Book collection elements Return date element
Order Book Collection	Publisher element Item elements Price element
Payments to Suppliers	Item elements Price element
Goods receipt	Item elements Stock elements

3.3. Application Architecture Design

The purpose of application architecture design is to define the main software that will be used to support business processes in libraries. This phase is performed to create a list of software candidates and define the applications of the information system. While software candidates can be obtained from the results of the analysis performed. Value chain analysis is used to determine candidate software. Candidate software are usually referred to as information system proposals for the future. These are listed in Table 2.

Table 2.

Application Architecture				
Activities	Required	Information Systems	Advice	Explanation
Order a book collection	Requires an information system that can monitor the purchasing process	Purchasing System	Information	New creation
Suppliers	Requires an information system to manage supplier data	Supplier System	Information	New creation
Gudang	Requires an information system to manage the stock of items in the library	Warehouse System	Information	New creation
Perpustakaan	Requires an information system that makes it	Library System	Information	New creation



Activities	Required	Information Systems Advice	Explanation
Marketing	easier for librarians to carry out circulation transactions Requires social media as a means of promotion and attracting library members	Social media account creation	New creation
Service	Requires a web library profile to improve services to library members	Web library profile	Build on existing needs

3.4. Infrastructure Design

This phase aims to distinguish the innovation requirements (devices and programs) needed in the library environment to run applications based on the application design and to monitor information based on the information design created.

Table 3.
Prospective Infrastructure

Prospective Infrastructure	
Hardware	
Computer	All in one branded computers:
Input Device	1. Keyboard 2. Mouse 3. Scanner 4. Barcode
Storage Media	5. CD/DVD 6. Harddisk portable
Software	
Operating System	Microsoft Windows Server 2013
Database Management System	Microsoft SQL Server 2014
Programming Language	Visual Basic.Net
Software Development Tools	ASP.Net
Office Application	1. Microsoft Office 2016 2. Nitro PDF Pro
Communications	
Network	1. LAN 2. WAN
Network Devices	1. Router/Switch 2. Access Point

3.5. Implementation Plan

Enterprise architecture implementation plans are created for the creation of new information systems and the development of existing information systems. Software development is also required to plan several stages in advance. Software development tailored to the needs of the library.

Table 4.
Implementation plan

Strategy	High Potential
Library	Library Information System
Supplier Information System	Supplier Information System
Service Information System	Web library profile

4. Conclusion

Based on the research findings of Jakarta National University Library, the following conclusions can be drawn:

- a. EAP implementation is a holistic strategy to optimize IT business alignment in libraries as well as competitive advantage.
- b. EAP can identify business processes based on information systems implementation plans.
- c. business process mainly includes activities such as registering new members, adding to the library collection, creating websites and promoting on social media, managing library collections, and checking out and returning books. Supporting activities include staff management, infrastructure management, information technology management, and book purchases, national journal subscriptions, international journal subscriptions, and e-book subscriptions.

The architecture created is a requirement that is met by the library. The advantage of EAP is that it develops vision, mission, functions, and business fundamentals that support planning and decision making.

5. References

- [1] Darmono, "Pengembangan Perpustakaan Sekolah sebagai Sumber Belajar," *Perpust. Sekol.*, no. 1, p. 2, 2007.
- [2] Ishak, *Pengelolaan Perpustakaan Berbasis Teknologi Informasi*. Pustaka, 2008.
- [3] M. Lankhorst, *Enterprise Architecture at Work*. Berlin: Springer, 2009.
- [4] Y. Parizeau, *Enterprise Architecture for Complex Government and the Challenge of Government On-line in Canada*. Dalhousie University, 2002.
- [5] K. Surendro, B. Kajian, S. Informasi, T. Informatika, and P. Arsitektur, "Pemanfaatan Enterprise Architecture Planning Untuk Perencanaan Strategis Sistem Informasi," *Pemanfaat. Enterp. Archit. Plan. Untuk Perenc. Strateg. Sist. Inf.*, vol. 8, no. 1, pp. 1–9, 2007, doi: 10.9744/informatika.8.1.pp.1-9.
- [6] H. K. Bharata, H. Sulistyowati, and S. Hanadwiputra, "Enterprise Architecture Planning Sistem Informasi STMIK Bani Saleh Dengan Zachman Framework," *J. Gerbang*, vol. 8, no. 1, pp. 80–88, 2018.
- [7] S. H. . S. C. H. Spewak, *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology 2nd Edition*. Boston: QED Information Sciences, 1993.
- [8] F. Nikipay, R. B. Ahmad, B. D. Rouhani, M. N. Mahrin, and S. Shamshirband, "An effective Enterprise Architecture Implementation Methodology," *Inf. Syst. E-bus. Manag.*, vol. 15, no. 4, pp. 927–962, 2017, doi: 10.1007/s10257-016-0336-5.
- [9] J. A. Zachman, "Framework for information systems architecture," *IBM Syst. J.*, vol. 38, no. 2, pp. 454–470, 1999, doi: 10.1147/sj.382.0454.

