



# Enterprise Architectural Planning Hospital Using Oracle Architecture Development Process (OADP) General Hospital Type C

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**Abstract.** The development of information technology and information systems, it is the main factor that can increase the efficiency and effectiveness of the main business processes that are carried out. In utilizing better information technology, a system that is connected to the desired application in achieving the hospital's goals. Therefore, we need an enterprise architecture (EA) design using the Oracle Architecture Development Process (OADP) method. This research produces a blueprint architecture by having 4 important components, namely business architecture, data architecture, application architecture and technology architecture.

**Keywords:** Enterprise Architecture · OADP · Blueprint Architecture

## 1 Introduction

Information technology is electronics that serves to store, distribute, analyze anything through the media. One of the current developments in information technology that is needed is in the health sector. Technological developments in the health sector are currently changing the system used in hospitals. So that there are many changes that follow the trend of information technology, one of which is the use of a system that can help facilitate the recap of patient data and the positive changes provided in the health sector [2]. However, often application or system development is not accompanied by careful planning. This results in failure in implementation because there are still many developments in information technology/information systems that do not consider interoperability as an important factor in development [1, 2].

Other problems that occur in this hospital are patient room information which is often wrong, the identity of the information on referral or non-referral patients who often experience confusion, the collection or recording of patient data at home that has not been carried out on time/on time manually, there is still a lack of use. Applications in hospitals and have not been integrated with each other. So, with the current condition, most of the data architecture uses documents or files which result in ineffectiveness which has an impact on loss or duplication of medical record data and affects patient satisfaction

both in terms of response time, does not work in an integrated manner, and information technology that does not support all applications. This hospital. An information system is a system that can support or assist in the process of hospital performance with the aim of being able to provide positive values or to improve hospital services itself [3, 4].

Overcome this incident we need a system that helps in overcoming the problems that occur in hospitals by using an enterprise architecture approach. Enterprise Architecture is a strategy that helps in the integration of IT or IT utilization strategies in processing, planning, designing and managing information systems and information technology with the aim of increasing alignment between technologies in identifying strategic goals appropriately [2, 8]. Enterprise architecture is a collection of systems that provide an overview of the stakeholder's mission whether it is functional, organizational place, performance measures and information [5, 6]. Previous research related to this research is a research conducted by Aulia entitled Corporate Architecture Planning in the Outpatient Installation section with the TOGAF ADM framework, which discusses using the Enterprise Architecture Planning method. Where in the research is not described or explained about the hospital's business processes, data architecture and system architecture and current technology [8].

In addition, to support the design using enterprise architecture, the OADP (Oracle Architecture Development Process) method is used in responding to problems that occur in hospitals. OADP is a method that helps align enterprise architecture and solutions with business strategies and goals by using a practical approach to working with customers collaboratively [7, 9]. In the OADP stage, Oracle creates an OADP process that is tailored to the target segment, domain or solution architecture such as application portfolio rationalization and IT optimization [4, 6].

The results of the information system architecture design using the OADP method produce a hospital blueprint which includes a list of current and future applications, information technology infrastructure, and Information Systems/Information Technology management strategies.

## 2 Research Methodology

The methodology used in this research is to use the OADP method which consists of the following steps architecture vision, current state architecture, future state architecture dan strategic roadmap.

### 2.1 Architecture Vision

Architecture vision is the initial step in the construction of the most important architectural hospital in the process. This stage, it discusses the vision and mission of designing hospital architecture which is carried out to support business activities in accordance with the vision and mission of the organization [4]. This stage performs an analysis of the requirements management which helps make it easier to analyze the architecture vision.

## **2.2 Current State Architecture**

This stage describes the current architectural conditions including business processes, applications used and the infrastructure available at the hospital. This stage of the current state architecture, an analysis is carried out based on requirements management with the aim of knowing the input and output of the current conditions needed in designing both in terms of business architecture, information architecture, and technology architecture [4].

## **2.3 Future State Architecture**

This stage, it has the function to plan future Enterprise Information System needs. This stage, it is not only focused on modeling the data architecture first, followed by the application architecture but can be done the other way around [4]. This stage of the future state architecture, requirements management is needed that can be used to find out what needs are needed to carry out future designs, both in terms of business architecture, data architecture, application architecture and technology architecture.

## **2.4 Strategic Roadmap**

The strategic roadmap stage, it determines the implementation planning strategy that must be carried out by looking at the success factors. The artifacts that will be produced are the architectural roadmap, implementation plan and architecture blueprint [4]. This stage, design the architecture execution plan by:

1. Maximize the value of each phase
2. Minimize risks and costs for proposed Enterprise Architecture initiatives
3. Considering technology dependency
4. Provide flexibility to adapt to new business priorities and technological changes from time to time.

## **2.5 Enterprise Architecture Governance**

This stage, evaluate the roadmap by choosing governance alternatives that can be applied effectively to ensure the success of the architectural development to the expected level [4]. In EA Governance, the results of EA Governance work are elements of people, process elements, technology elements, financial elements and policy elements [9]. The tasks carried out at the Enterprises Architecture Governance stage are:

1. Identify the governance of the existing architecture
2. Assess the effectiveness of obeying Manage
3. Recommend changes to the Governance model
4. Validation

## 2.6 Business Case

This stage, we analyze the cost benefits for the development of enterprise architecture [4]. In analyzing the cost benefits for IT architecture and projects in the roadmap, a business case is needed that defines the architecture of the future conditions and the proposed roadmap in achieving IT business alignment and meeting business objectives [9]. At this stage the business case tasks are:

1. Collect current state of cost or risk
2. Assess against benchmarks & goals
3. Determine risk and projected future costs
4. Estimated Enterprise Architecture investment roadmap
5. Make a cost analysis Related to enterprise architecture planning, this research is limited to the strategic roadmap stage.

## 3 Architectural Design

### 3.1 Architecture Vision

The following describes the requirements catalog for the architecture vision phase in Table 1.

Analyzing the architecture vision, the next step is to determine the principles used by creating a principle catalog table that is used to describe the principles that will be used in the hospital. The following describes the hospital's principle catalog table which can be seen in Table 2.

### 3.2 Current State Architecture

The following describes the requirements catalog for the business architecture phase which is described in Table 3.

**Table 1.** Requirement Catalog Fase Architecture Vison

Input	Output
1. Organizational vision and mission 2. Profile and organizational structure of the hospital 3. Hospital service standards 4. Hospital strategic plan 5. Hospital internal overview	1. Business architecture vision using information technology to support hospital services used by stakeholders. 2. Vision of data architecture with the availability of an integrated database to support hospital information systems. 3. Application architecture vision by designing and developing information systems to support the hospital's vision and business processes. 4. Vision of technology architecture, availability of technology that supports applications, data and hospital business processes that are designed.

**Table 2.** Principle Catalog

Principle	Description
Quality of health services	Improving the quality of hospital health services by evaluating based on performance reports and input from patients.
Patient safety and healing	Prioritizing the safety and healing of every patient who visits the hospital.
Readiness and hospitality	Provide accountable treatment needs and services.
Quality employee education	The existence of training and performance assessment in improving the quality of hospital human resources.
Legal compliance	All business processes and hospital governance must comply with regulations from the Ministry of Health, and regulations that apply to hospitals.
Employee welfare	Prioritizing the welfare of hospital employees by providing BPJS Health and the existence of a pension program at BPJS.
Data is an asset	Hospital data is an asset that must be kept confidential and secure.
Accurate data	The data must be accountable for its truth and ownership.
Easy to use app	Applications at the hospital can be used easily.
App access rights	Application access rights must be limited according to the level of use based on hospital decisions and SOP
Real time technology	Technology is able to support the system to match the hospital’s business processes that make it easier to get information.
Technology infrastructure security	The existing technology in the hospital must be safe from risks that occur both internally and externally.
Interoperabilitas	There is standardization of software, hardware and technology so that they can be well integrated.

**Table 3.** Requirement catalog fase business architecture

Input	Output
1. Current business conditions 2. Ongoing business processes	1. Value chain of ongoing business processes 2. Function business catalog 3. List of stakeholders 4. Process and Organizational Relationship Matrix (RACI CHART)

After analyzing the requirements catalog in the business architecture phase, it is necessary to define the activities of the main functional areas of the hospital.

Ongoing business processes at the hospital, especially in the outpatient, inpatient, ER and medical records functions. Where in each of these functions in the stages of business processes carried out by the hospital, it is still carried out computerized and some still use files for recording patient medical records. So, this stage of the Table 4. Process Catalog application business process flow, the general stages of the outpatient, inpatient, ER and medical record business processes are described. In this stage of the business process, the process catalog is used which is described in Table 4.

Supporting existing business activities and running the existing SIMRS system, this hospital has a technology architecture as illustrated in the following technology application footprint in Fig. 1.

### 3.3 Future State Architecture

The following describes the requirements catalog for the business architecture phase which is described in Table 5.

This data architecture stage explains what data classes are used by each application and how the data flows. The lines below describe integration between systems, with bold lines indicating direct relationships between processes and dashed lines indicating control relationships between processes. The following describes the information architecture based on the data class perspective which is depicted in Fig. 2.

In determining the usability of the application, it is necessary to identify the application needs in accordance with what is needed in the outpatient, inpatient, ER and hospital medical records which are mapped in the form of application architecture requirements. The requirements for this application will be described in Table 6.

Deployment diagram application is used to determine the layout of a system application, by showing the parts of the application running on the hardware. The following describes the deployment diagram of the application as described in Fig. 3.

This stage, identify the existing technology infrastructure in building technology architecture that is tailored to the hospital's requirements. Requirements are described in Table 7.

The Environment and Location Diagram stage, identify what technology or application is used along with the location of business users who interact with applications that are interconnected between components. The following describes the Hospital Environment and Location Diagram model which can be seen in Fig. 4.

### 3.4 Strategic Roadmap

The results of the strategic roadmap stage are the architectural roadmap, implementation plan and architecture blueprint. The architecture blueprint describes the overall artifacts produced when designing the information system architecture for hospital service functions using the OADP method. The implementation of the new roadmap architecture is described in Table 8.

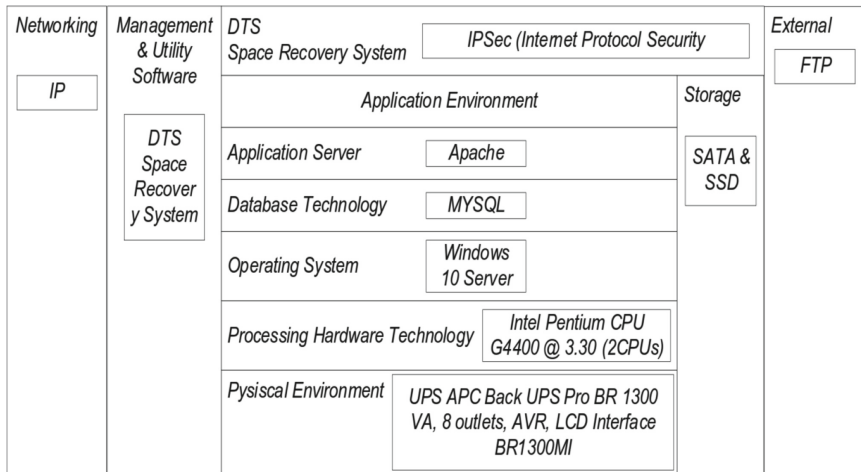
**Table 4.** Process Catalog application

Function	Sub Function	Service	Organizational Process
Medical records	Governance RM	Medical record file storage	Medical record file storage
		Separation of medical record files	Medical record file retention
		Medical Record Reporting	Medical Record Reporting
	File management RM	Data Management and Analysis	Medical record file filling
		Trace medical record files	Borrowing and retrieving medical record files
	File destruction RM	Destruction of medical record files	Destruction of medical record files
Formation of an Extermination TEAM			
Outpatient	Service management	Outpatient Service	Outpatient registration
			Implementation of outpatient services
			Outpatient service payments
	Outpatient management	Outpatient reporting	Outpatient activity reporting
Inpatient	Service management	Inpatient services	Patient admitted to hospital
			Recording of inpatient nursing actions
			Inpatient discharge patient
		Inpatient management	Hospitalization reporting
IGD	Service management IGD	Service IGD	Patient Admission
			Patient Discharge

*(continued)*

**Table 4.** (continued)

Function	Sub Function	Service	Organizational Process
	Inpatient management	Reporting IGD	Activity reporting IGD

**Fig. 1.** Technology Footprint**Table 5.** Business Requirement Catalog

Goal	Objective	Requirement
To become a national standard hospital	Improve customer satisfaction	Availability of a system that facilitates service to patients
		Involve patients or their families in measuring satisfaction with hospital services
		Provide effective communication to patients/patients' families and respond to needs, input and problem solving
		Response time service time that can be completed as soon as possible

(continued)



**Table 5.** (continued)

Goal	Objective	Requirement
	Objective	Requirement
	Improving the quality of health services	The achievement of 60% completeness of filling out medical records in approximately 1 × 24 h
		Returning the patient's medical record to the medical record 2 × 24 h
		Hospital reporting in accordance with medical record rules and standards
		Borrowing medical records in accordance with the rules for borrowing medical records.
		The response time of the doctor's service in the emergency department is approximately 5 min after the patient arrives
		Availability of room facilities and services according to the patient's request class
		Continuous improvement of employee skills, competencies and knowledge
	Availability of training materials in accordance with the rules of medical records.	
	There is codification & INA CBG'S training	
	Number of human resources according to accreditation standards and workload	Implementing cooperation with the HR department to select employees based on hospital needs

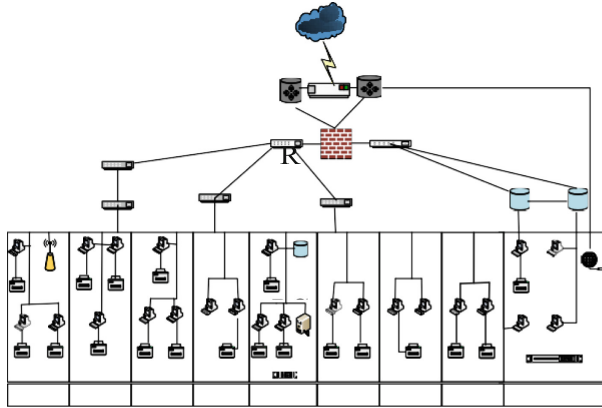


**Table 6.** (continued)

No	Requirement
4	The application can only be accessed according to the level of use that has been determined by the hospital
5	The application is easy to use by users
6	Applications can be modified according to business needs
7	The application can support data management and analysis services, separation of medical records, reporting of medical records and tracing of medical records.
8	Applications can support outpatient registration services, implementation of outpatient services, outpatient payments, and outpatient reporting
9	Applications can manage input data from patients
10	The application can support inpatient services, inpatient nursing records, inpatient discharges and inpatient reporting with the existing platform.
11	Applications can make it easier to provide room availability data in real time
12	Applications can manage inpatient data in real time
13	Applications can support Patient Admission services, discharge of ER patients and reporting of ER activities with the existing platform
14	The application is able to provide convenience in recording patient medical actions

**Table 7.** Technology Architecture Requirement

No	Requirement
1	Availability of network infrastructure backup
2	Security of technology infrastructure according to the rules
3	There is documentation of technology
4	Technology infrastructure can support the use of integrated applications
5	The technology infrastructure used can process a lot of data transactions
6	Availability of periodic maintenance of technology infrastructure
7	There is periodic maintenance of technology infrastructure



**Fig. 4.** Environment and Location Diagram

**Table 8.** Architecture Roadmap

	Current State	Established Common Hospital Apps	Migration to Common Application	Single Hospital Application
<b>Business</b>	Business processes are still done manually and have not been integrated	<ol style="list-style-type: none"> <li>1. Define hospital management standards</li> <li>2. Defining the hospital's primary needs</li> </ol>	Initiate existing business processes according to hospital standards	Running an integrated hospital business process
<b>Application</b>	The application used is not standardized	<ol style="list-style-type: none"> <li>1. Define application requirements based on hospital business processes</li> <li>2. Installation of existing standard applications</li> <li>3. Designing an application to perform a migration agenda</li> </ol>	<ol style="list-style-type: none"> <li>1. Training on using the new app</li> <li>2. Consolidate use of new apps</li> <li>3. Executing the migration plan</li> </ol>	<ol style="list-style-type: none"> <li>1. All stakeholders involved run the application standard</li> <li>2. Deactivating old apps</li> </ol>

(continued)

**Table 8.** (continued)

	Current State	Established Common Hospital Apps	Migration to Common Application	Single Hospital Application
Information	Information overlaps and is stored in multiple databases	<ol style="list-style-type: none"> <li>1. Define information needs based on business processes and applications designed for hospital.</li> <li>2. Define and define data and information</li> <li>3. Define integrated data storage</li> </ol>	Formalize procedures in data governance	The data management process is executed
Technology	There is no standard supporting application yet	<ol style="list-style-type: none"> <li>1. Define technology needs based on applications and information used for hospitals</li> <li>2. At the infrastructure stage, a mutually supportive infrastructure setup</li> </ol>	Running a new platform instance	Perform adjustments with all application functions that support

## 4 Conclusion

Based on the results of the discussion above, it can be concluded several points as follows:

- a. The design of the hospital service information system architecture using the Aracle Architecture Development Process (OADP) results in the analysis and development of hospital SIMRS which have several applications that are integrated with each other.
- b. The application architecture, the design or development of the hospital SIMRS has 4 categories of applications that are integrated with each other equipped with several modules, namely outpatient applications consisting of 4 modules, inpatient applications consisting of 4 modules, ER applications consisting of 3 modules and recording applications. The medical system consists of 4 modules that are integrated with each other. To see the results of the design can be seen in the blueprint architecture which describes the overall results of the architectural design artifacts.
- c. In designing enterprise architecture in hospitals, it can be done using OADP and can use the TOGAF ADM Framework. Where in the design using the OADP method is not as detailed as the design carried out using TOGAF ADM.

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