ANALYSIS AND DESIGN OF ACADEMIC INFORMATION SYSTEM (AIS)

USING SERVICE ORIENTED ARCHITECTURE (SOA)

(Enrollment and Academic Administration Department at Syarif Hidayatullah State Islamic University Jakarta)

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FACULTY OF SCIENCE AND TECHNOLOGY

SYARIF HIDAYATULLAH STATE ISLAMIC UNIVERSITY

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(CASE STUDY: ACADEMIC ADMINISTRATION AND ENROLLMENT DEPARTMENT, SYARIF HIDAYATULLAH STATE ISLAMIC UNIVERSITY JAKARTA)

THESIS

As one of terms to acquire bachelor degree in Information Systems Faculty of Science and Technology Syarif Hidayatullah State Islamic University Jakarta

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DEPARTMENT OF INFORMATION SYSTEMS (INTERNATIONAL PROGRAMS)

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UNIVERSITY JAKARTA)

Thesis
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Faculty of Science and Technology Syarif Hidayatullah State Islamic University Jakarta

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Thesis writing which the title is “analysis and design of Academic Information System (Ais) Using Service Oriented Architecture (SOA) Case Study: Academic Administration and Enrollment, Syarif Hidayatullah State Islamic University Jakarta”, it has been tested and passed in Thesis Defense (Munaqosah) Faculty of Science and Technology, Syarif Hidayatullah State Islamic University Jakarta on Monday, 29th June 2015. This Thesis writing as a requirement for achieving a bachelor degree for computer at Information System major.
DECLARATION

I HEREBY DECLARE THAT THE THESIS TITLE ANALYSIS AND DESIGN USING SOA APPROACH (STUDY CASE: SYARIF HIDAYATULLAH STATE ISLAMIC UNIVERSITY JAKARTA) IS MY OWN WORK. THE WORK PRESENTED IN THIS THESIS IS THE RESULT OF ORIGINAL RESEARCH DONE BY MYSELF. THIS THESIS HAS NOT BEEN SUBMITTED FOR ANY OTHER DEGREE OR AWARD IN ANY OTHER UNIVERSITY OR EDUCATIONAL ESTABLISHMENT.

Jakarta, July 2015

Widyastuti Puspita Wijaya
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ABSTRACT

Widyastuti Puspita Wijaya – 1110093100014, Analysis And Design Of Academic Information System (AIS) Using Service Oriented Architecture (SOA) Approach Case Study: UIN Syarif Hidayatullah Jakarta under the guidance of Dr. Ahmad Nurul Fajar, ST., MT., and Asep Fajar Firmansyah Iwa Airlangga, MTI.

Syarif Hidayatulllah State Islamic University Jakarta has planned to implement SOA Orchestration in order to optimize the business functionalities which support whole system within the institution. This research will focus on one process business in academic administration department, KHS. SOA is designed for bridging data communication between web services through service interfaces. In certain studies, Service Oriented Architecture Delivery Lifecycle (SOADL) is one of proper methodologies that supports an orchestration development. This research will follow two steps of SOADL includes Service Orientation Analysis and Services Orientation Design. As the result, the orchestration development itself will be a set of process service (Controller) which encapsulates an application service layer according to business rules and business logic. Furthermore, Business Process Management Notation (BPMN) will generate all the sequence of task and gateway as Business Process Execution Language (BPEL), where the orchestration business rules as partner service which can adjust as a part of the process definition. Begin with defining the business scope by taking samples from the smallest part of Academic Information System, this research will be focused on business process of Enrollment and Academic Administration. The deliverable output of this research is a set of process services and can be used as additional features for a system that will institution used in the future.

Keyword: SOADL, Orchestration, BPMN, KHS, UIN Jakarta

I-V chapters + 155 pages + xiii pages + 89 figures + 57 tables + References + Appendix
Acknowledgement

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All praise to Allah who enabled gives mercy and hidayah, finally enables the author to finish this thesis with title “Analysis and Design Academic Information System Using SOA Tools (Case Study; Syarif Hidayatullah State Islamic University Jakarta)”. This thesis is a prerequisite to obtain a bachelor degree from study program of Information System at Faculty of Science and Technology, UIN Syarif Hidayatullah Jakarta.

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South Tangerang, June 2015

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CHAPTER I
INTRODUCTION

1.1 Background

Information technology has proved as something that can be useful, especially for public-sectors. Means, that it possibly technology already gives more values for any aspect of life, such as economic, social, culture, and educations (Rahardi, 2007).

The technology also brings impact for the institution such as Syarif Hidayatullah State Islamic University, Jakarta. In order to improve their services and quality in education sectors and optimized to create a workforce competitiveness. The institution provides more than ten websites based applications such as Academic Information System (AIS), SPMB Online Registration, E-Library, and BKD Online which is part of existing applications and currently running at the university. In fact, that the used by web based application depending on internet access, means, those websites based application must enable to bring new value toward business-to-business interaction. However, the existence of web-based application have possibilities that allows data redundancy or even security is vulnerable to attack (Pustipanda, 2014).
Behind the existence of these applications, Syarif Hidayatullah State Islamic University has a variety of problems ranging from hundreds of business processes that need to be improved. Provision of IT labor is still 2:1000 in the provision of services and deliver information security vulnerability web portal so easily intercepted. To optimize existing business processes and applications that are currently running, middleware is becoming one of the alternatives for this institution (Pustipanda, 2014).

Literally, Middleware is tools that several companies tried to implement in order to bridging application and current services (Theurkorn Fenix, 2005). In accordance with the topics to be discussed, researchers found few studies with a middleware approach that used based on educational or institutional needs. SOA approach uses orchestration tends to be used as research material.

The use of the SOA orchestration approach with different standards and communication mechanism is expected to provide real-time performance and automated security enforcement and management. From the series on the use of SOA within the scope of the university was expected to create a student management system that supports the core and supporting system.

Orchestration techniques are one of business process logic which can be run simultaneously. Orchestration consists of a controller that coordinates all the activities and process.

Therefore, "Analysis and Design of Academic Information System (AIS) using Service Oriented Architecture (SOA)" is fundamental research and can be used as an alternative solution for Syarif Hidayatullah State Islamic
University Jakarta for supports SOA development. In ongoing research, the presence of SOA orchestration provides integration to the existing system and the user is able to meet the standard requirements and provides flexibility. While, the presence of SOA in institutional environment is expected to improve the service and more agile in its business process.

1.2 Problem Identification

According to the previous background and observation which carried out in Syarif Hidayatullah State Islamic University Jakarta, below are details about problem identification which already founds:

a. Inconsistent procedure for partial activities which is caused existing standard Operating Procedure (SOP) from most of department still out of dates.

b. The institution already has several information systems to support several business processes. However, most of information system in the institution not integrated and stand-alone. In several cases, it will cause the user to use different account and password for different information system.

c. IT Planning Blueprint for the institution provides SOA Orchestration planning. However, details about the implementation describes as application target baseline, but not specifically for its development.

1.3 Problem Statement

Based on a previous problem identification concludes “How SOA Orchestration can be designed for academic information systems?”
1.4 Limitation

Regarding with a range of research, the authors determined the limitation of the research includes:

a. This Research would be conduct at Syarif Hidayatullah State Islamic University Jakarta and would focus in the Bureau of Academic Administration.

b. Scope of business process would encompass enrollment and academic administrative activities. However, this research will be focus on one of business process in academic administration involved KHS (Kartu Hasil Studi).

c. A methodology that would be used for this research is SOA Delivery Lifecycles. However, the methodology only discusses two main steps, including Service Oriented Analysis and Service Oriented Design.

d. The rest step of Service Oriented Analysis such as revised operation grouping, analyze process requirements, identify application service operations, create application service candidates, revise service compositions, and revise operation grouping will be not explained furthermore in this research.

e. In service oriented design. This step would not defined more details about programming execution language.

f. Tools to design workflow diagram and service composition will used Microsoft Visio. While developing BPMN and business rules will used Business Process Modelling Studio (BPMS) Intalio Community and
Unified Modelling Language (UML) Sequence Diagram to describing service scenarios.

1.5 Research Purpose

The main purpose done with this research is to create a basic form of SOA Orchestration for Syarif Hidayatullah State Islamic University. And, the specific purpose of this research:

a. Understanding the implementation of SOA Delivery Lifecycle methodologies and BPMN tools for orchestration.

b. Analyzing enrollment and division of academic administration business process as workflow logic. As the result, delivered service composition and business process modelling as service recommendation that will support the system.

c. Building service-oriented solution to support enrollment and division of academic administration business process which perhaps the services can be more effective and optimal.

d. As a prerequisite to acquire bachelor degrees of information system in Syarif Hidayatullah State Islamic University.

1.6 Research Benefit

By doing this research, authors, perhaps it can bring more benefit values, including:

a. The design of service composition and service interface, perhaps can be used to support institution for SOA developments.
b. Understanding the use of SOA delivery lifecycle methodology and BPMN as part of SOA development.

c. As an alternative solution or reference guides for further more research related to web service and SOA implementation.

1.7 Methodology

This research will be divided into two parts including data collection method and SOA Delivery lifecycle method.

1.7.1 Data Collection Method

The data collection method encompasses several activities such as:

a. Literature Study

A method where the researcher reviews similar studies such as journal, previous research about Service Oriented Architecture (Nazir, 2005).

b. Library Study

Due to this research, library study will be used to understand and as fundamental for research relates with Service Oriented Architecture and orchestration (Jogiyanto, 2008).

c. Observation

In this research, the author used physical process analysis, which is based on time and motion from a process, such as an existing procedure in enrollment and academic administration activities (Jogiyanto, 2008).

d. Interviews
In this chance, the researcher used intercept interview from academic administration and finance at Syarif Hidayatullah State Islamic University (Jogiyanto, 2008).

1.7.2 Service Development Methodology

Service Orientation Architecture Delivery Lifecycle methods are used to delivered service orientation solution. This research will only implements two early steps of SOADL encompasses:

1. Service Oriented Analysis

The initial stage that mapped out service layer, individual services are modeled as service candidates that comprise a preliminary SOA. This stage contains sub-processes provide steps for the modeling of an SOA consisting of application service, business service, and orchestration service layers (Erl, 2005). Below is a detailed step service oriented analysis, includes:

1.1 Define the analysis scope. In this stage will describes general overview of business need. It will perform value chain, high level business functionalities (Bell, Michael, 2006).

1.2 Existing Automation System. This step will identify existing system which is probably already integrated.

1.3 Service Modelling. This step is sub-step of the service oriented analysis and including technical matter designing service composition. The sub-step of service modelling consist of:
1.3.1 Decompose Business Process. Consist of workflow logic that will breakdown into smallest part. The result of this workflow logic is business primitive activity.

1.3.2 Identify Operation Candidates. This step will concludes the list of service candidates and operation candidates, after identifying business primitive activity.

1.3.3 Abstract Orchestration Logic. This step requires to identify business rules for each service candidates which consist of conditional logic, exceptional logic, and sequence logic.

1.3.4 Create Service Candidates. Represent the identified service candidates and operation candidates based on orchestration layer and business service layers.

1.3.5 Refine and Apply Service Operation. Consist of details of SOA principles that would be used to optimized existing services. It would identified the application service for each service candidates.

1.3.6 Identify Service Composition. Revised existing service candidates and represent latest service candidates and operation candidates based on three layers including orchestration layer, business service layer, and application service layer.

2. Service Oriented Design

This phase contains with key decisions that establish the hard logic boundaries encapsulated by services. The service layers designed during this
stage can include the orchestration layer, which results in a formal business process definition. The service oriented design includes:

2.1 Compose SOA, consist of identifying kinds of tools that used to develop service candidates.

2.2 Design Entity Centric. Consist of step including review the existing candidate service and create message schema types for KHS process service.

2.3 Design Application services. Consist of step including review the existing candidate service and revised the operation services.

2.4 Design Task Centric. Consist of step including workflow logic and service interface interaction.

2.5 Business Process Design. This step represent the visual representation of service candidates in business process modelling notation.

1.8 The Systematic of Research

CHAPTER I. BACKGROUND
In this chapter, the author will discuss the general perspective of the research including background, problem identification, problem statement, and scope of research, objectives, research benefit, research methodology, and the systematics of research.

CHAPTER II. LITERATURE REVIEW
This chapter will explain general overview and related studies for this research. It would encompasses Service
Oriented Architecture, Orchestration, Business Process Modelling Notation, and description about methodologies and tools that used in this research.

CHAPTER III. METHODOLOGY

This chapter will describe the initial steps of collecting data methods and SOA delivery Lifecycle method such as service oriented analysis and service oriented design, and logical frameworks.

CHAPTER IV RESULT AND DISCUSSION

This chapter will discuss business analysis scope, existing automated system, and service modelling as part of service oriented analysis. And, service oriented design will represent high-level of entity centric, task centric, and business process design.

CHAPTER V. SUGGESTION AND RECOMMENDATION

Consist of conclusion after result and discussion. It will summarize the limitation of research, suggestion, and solution that needs to cover for the institution and furthermore research.
CHAPTER II
LITERATURE REVIEW

2.1 Concepts of Information System

According to O’Brien (2005) Information system organized people, hardware, software, communications networks, and, data resources that collect and transforms information for organizational needs.

2.2 Academics

According to the Oxford dictionary, academic is an institution or a course of study. The word origin introduces in the 16th century, from French academic or medieval Latin academicus, basically from academia, from Greek academia, introduce after the hero named Plato was garden was named. Academic mean pertaining to the development of the mind (Simanek, Donald E., 1996).

2.3 Academic Information System

Academic Information System (AIS) is an online website application or portal that uses for academic needs. Related activities that can be done by AIS encompasses academic administration, class management, and more.

2.4 Data Collection Method

2.4.1 Observation

Observation is techniques to get primary data by doing direct monitoring toward its data objects. The Observation physical process analysis is observation techniques based on time and motion from specific process (Jogiyanto, 2008).
2.4.2 Interview

Interviews are communication approach between the two peoples to receive valid data from respondents. Means, the interview techniques can be used to get direct information or resources (Jogiyanto, 2008).

2.4.3 Literature Study

The purpose of literature study is to learn its study systematically, in order to open mind related with the latest knowledge and the relation with the research itself (Nazir, 2005).

2.4.4 Library Study

Library study has reviewed the previous research by identifying the weakness and contribution had been delivered. Library study also refer as relevant case of any issues that already found.

2.5 Definition of Analysis and Design

The system can be defined as collection of IT component that brings results for the user (Shelly & Rosenblatt, 2012). While design is an activity of developing IT component to be available. Both activities are related each other to determine standard business requirement that answer organization needs. During this term, System analysis and design are systematic process using tools to improve business with the implementation or modification within the information system (Kendall, 2011).

Analysis and design within the Service Orientation can be described as service phases that deliver service solution. They also include service modelling to establish the physical service solution includes foundation software, legacy
software, utilities software, and repositories. Means, SOA in analysis and design is a technology capability that develops to transforming organizational need in order to provide agility and flexible service and delivered that service as an organizational asset (Bell, 2008).

2.6 Service-Orientation

Service Orientation has been recognized after object oriented modeling and component-based model is prevalent in 80’s and 90’s. Object oriented is traditional approach that used to develop information systems. In its implementation, object oriented identically development by using orientation methodologies such SDLC, Waterfall, and RAD. UML is an important activity that used to define user needs. Specifically, Object oriented worked incrementally. Structural view, functional view, behavioral view is object oriented architectural view that represents and define functional requirement which is real world actually need (Dennis, Wixom, Tegarden, 2009).

In other hand, Kung Kiu Lau (2004), Component-based model more detail than object oriented. It is known as reused based approach to defining, implementing, and composing loose coupling independent component in the system. CORBA (Common Object Request Broker Architecture) provides CCM (CORBA Component Model) as a framework where containers offer set of service that can use. This service includes notification, authentication, persistence, and transaction processing (LauKung, 2004).

OOM and CBSE (Component Based Software Engineering) widely defined how Service Orientation develops. The Service Orientation is well known as service
oriented modelling is a software development practice that implementing service discipline and language to provide strategic and tactical solution for the enterprise problem (Bell, Michael, 2008).

Table 2.1 Distributed Architecture Styles - source: Tehlin, J, (2003)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Object-oriented</th>
<th>Resource-Oriented</th>
<th>Service Oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granularity</td>
<td>Object instances</td>
<td>Resource instances</td>
<td>Service instances</td>
</tr>
<tr>
<td>Main Focus</td>
<td>Marshaling parameter values</td>
<td>Request addressing</td>
<td>Creation of request payload</td>
</tr>
<tr>
<td>Application Interface</td>
<td>More specific toward class – means nearly to describe as middleware</td>
<td>Generic to the request mechanism</td>
<td>Specific to this service – Description is Protocol specific (e.g. WSDL)</td>
</tr>
<tr>
<td>Payload data format or description</td>
<td>Specific middleware</td>
<td>Nothing directly Linked to address / URL</td>
<td>Part of service description (e.g. XML Schema in WSDL)</td>
</tr>
</tbody>
</table>

2.7 Web Service Framework

2.7.1 Fundamental Concept of Web Services

The web service is developed based on functionalities to support an organization or agency. Within web service, there are 3 basic components such service requestor, service provider, and service registry. Figure 2.1 represents Service provider and service requestor must communicate each other (BoothDavid & HaasHugo, 2004). Both activities provide service description contains information that can be exchanged by using messaging.
The web service is different with web based application. However web services are tools that support integrating web-based application through connecting and sharing of business process across the network where applications actually have different language and platform. While, web-based application depends on the web browser and developed such as HTML, JavaScript (Al-FedaghiSabah, 2011).

Below is clearly comparison between web based application and web services:

Table 2.2 Comparison between web service and web based application, (Al-Fedagi, 2011)

<table>
<thead>
<tr>
<th>Web Based Application</th>
<th>Web Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Business to business interaction</td>
<td>• Connecting and sharing different business process and web-based application</td>
</tr>
<tr>
<td></td>
<td>• Provide tools for developing and implementing business process, WSDL, and BPEL</td>
</tr>
<tr>
<td>• Provide a vital process for transactional activities and depending on the browser.</td>
<td>• Examples: Amazon.com</td>
</tr>
<tr>
<td>• Examples: webmail, online auction</td>
<td></td>
</tr>
</tbody>
</table>

2.7.2 Web Service Element

2.3.2.1 Service Description

According to Hass (2004) service description referred to mechanism of exchange message within web service description language. As service discovery, service description allows providing repositories to locate and select a service description that meets the required functional criteria (BoothDavid & HaasHugo, 2004). Universal Description, Discovery and Integration (UDDI) is an xml-based registry, directory service where businesses can register and search for Web
services. Based on IETF and W3C, UDDI provided standard specification utilities such as xml, http, dns, and SOAP messaging for cross platform programming.

Located in central, service description divides into two types includes public registries which accepts registrations from any organizations, when once signed up, organizations acting as service provider entities can register their services. And, Private registries which are can be implemented within organizational boundaries to provide a central repository for descriptions of all services the organization for developing, leases, or purchases (Erl, Thomas, 2005).

2.3.2.2 Service Requestor

Service requestor or service consumer had ability to bring out request message that easier to understand for service providers. This service consists of a web service which contains the application component and mobile devices.

![Figure 2.1 Web Service, Service Requestor, (Erl, Thomas. 2005)](image)

Similar with service providers, service request or classified into two parts including service requestor entity and service requestor agent (Erl, Thomas, 2005).
2.3.2.4 Service Provider

The service provider is used to identify an agent (individual or organization) responsible for providing web services. A service provider will reply service request with the response message. Service provider classified into two agents includes service requestor entity and service requestor agent (Erl, 2005).
2.3.2.4 Messaging

The main purpose of messaging is to build communication between services. Simple Object Access Protocol (SOAP) specification’s main purpose is to define a standard message format. SOAP message contains envelope, header, and body.

![SOAP structure](image)

**Figure 2.3 SOAP structure, (Erl, Thomas. 2005)**

Envelop responsible to place the entire message (Erl, Thomas, 2005). The header represents part of a message can include information to extended Web services functionality, such as security, transaction context, orchestration information, message routing information, or management information. The last one, bodies as a part of message content. The form of the message body, and other constraints on the body, may be expressed as part of the service description (Dennis, Wixom, & Tegarden, 2009).

2.7.3 Web Service Technology

2.3.3.1 BPEL

BPEL is an execution programming language. Before it becomes BPEL, things that important is defined message, interface, schema, variables, types, and binding.
However, these technologies were actually not needed because BPMN already supports for process execution (PantKapil & JuricMatjaz, 2008).

2.3.3.2 WSDL

WSDL is an XML format for describing network services as a set of endpoints operating on messages containing either document-oriented or procedure-oriented information. WSDL is extensible to allow description of endpoints and their messages regardless of what message formats or network protocols are used to communicate (Christensen, Curbera, Meredith, & Weerawarana, 2001). According to Alonso (2004), he explains that there are three steps of developing a WSDL interface includes:

a. Defining a WSDL interface is to identify and define all the data structures that will be exchanged as parts of messages between applications.

b. Define messages that build on such data structures. In WSDL, each message is a typed document divided into pairs. Each part is characterized by a name and by a type, referring to a type typically defined in XML schema.

c. Defining a WSDL interface is to define operations, also called transmission primitives or interactions. There are four basic operations:

- One-way and notification operations involve a single message. In one-way interaction, the client invokes a service by sending a message.

- In notifications, it is the service that sends the message.

- Request-response and solicit-response involves the exchange of two messages. The former is initiated from outside the service

d. Defining an abstract WSDL interface is to group operations into port types.
There are two categories of WSDL such as abstract description and concrete description that collectively describe as a service endpoint.

Figure 2. 4 WSDL specification,( Alonso, Kuno, Casati 2004)

Abstract description allows represent interface character within the web service without involving existing technology. While concrete description possibly needs involving current technology to build real communication between web service and physical transport protocol (ErI, Thomas, 2005).

Figure 2.7 has describes the detailed of the WSDL specification. According to Alonso (2004) Abstract description contains construction such as types, messages, operation, and port types. Each port type is a logical collection of related operations. Each operation defines a simple exchange of messages. All of this parameter is included in the XML. In other hand, Concrete description contains construction such as:

- **InterfaceBinding**, that specifies the message encoding and protocol bindings for all operations and messages defined in a given port type.
- **Ports**, also known as EndPoints, ports combine the InterfaceBinding information with a network address (specified by a URI) at which the implementation of the port type can be accessed.

- **Services**, Services are a logical grouping of ports. Note that, at least in principle, this also means that a specific WSDL service could be available at different Web addresses.

### 2.3.3.3 UDDI

UDDI is a platform-independent framework for describing services, discovering businesses, and integrating business services by using the Internet. According to Tyler Jewell (2002) UDDI registry that contains a business can register three types of information.

![Figure 2.5 UDDI works within web service (Alonso, 2004)](image)

Figure 2.7 Describe the relevances between UDDI and web service. UDDI technically contains a data structure that used to pass as input and output API with XML format. According to Tyler Jewel (2002), there are several structures that used in UDDI include:
a. **businessEntity**, the structure represents a business basic information. This includes contact information, categorization, identifiers, descriptions, and relationships with other business.

b. **publisherAssertion**, the structure used to establish a public relationship between businessEntity structure. Business Entity only visible in public when both companies created the same assertion with two separate publisher assertion documents independently.

c. **businessService**, contains more bindingTemplate structure. This template consists of pointing to technical description and the access point URL, but does not contain more detail about service specification. It contains text descriptions of the web service, url to access points, and reference tModel structures.

d. **tModel**, an abstract description of a particular specification or behavior to which the web service adheres.

2.8 Service Oriented Architecture

2.8.1 Conceptual of Service Oriented Architecture

Service Oriented Architecture (SOA) is well known as Service Orientation which is automating business logic as a distributed system. SOA is an architectural style for building service based enterprise solutions. SOA combines business process and business services within the organization to provide an existing system like database or application program as services. These services have enabled whole user and process to access these functionalities, and at the same time allowing data exchange in individual processes (Marks, Bell, 2006).
Figure 2.6 Relation within SOA, (Rosen, 2008)

Figure 2.8 describes the technical concept of SOA which is included Service, Enterprise Service Bus (ESB), Enterprise Business Process, and Integration Service. An enterprise business process is a specific kind of business process that spans business domains within the enterprise. It contains business model that supports business process which is related to business goals and strategy. The services or web services represent business functionalities, it provides a collection of method that can be accessed by the network. Web service used XML for data exchanges, it involved Enterprise Service Bus—an infrastructure within an SOA that also used to bridge service by using data mapping and routing. At the same time, ESB builds connectivity with integration service to provide standard Enterprise Business Process (RosenMichael, LublinskyBoris, SmithKevin, 2008).
Table 2. 3 EAI vs ESB vs SOA (Goel, Anurag)

<table>
<thead>
<tr>
<th>EAI</th>
<th>ESB</th>
<th>SOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Make diverse application in the enterprise include a partner system to communicate each other</td>
<td>- Integration technology to support SOA</td>
<td>- An approach to well-defined services work within distributed system architecture</td>
</tr>
<tr>
<td>- Comprises of message acceptance, transformation, translation, routing, message delivery and business process management.</td>
<td>- Provide API as service interface to communicate with one and other service</td>
<td>- Using WSDL, UDDI, and SOAP</td>
</tr>
<tr>
<td>- Using message transportation: Hub/spoke and Bus</td>
<td>- Protocol conversion, message format transformation, routing, accept and deliver messages from various services and application which are linked.</td>
<td></td>
</tr>
</tbody>
</table>

Pertaining to SOA, this approach always related to middleware—services software that executes between the operating system layer and the application layer and provides services. It connects two or more applications, thus providing connectivity and interoperability to the applications.

Enterprise service bus and Web service are equally as integration technology. The things that difference between both technologies is deliverable output. ESB works almost similar like EAI, to build transportation between services, have higher levels of dependency, robustness, and security, management, and control of services and their communication. While, a Web service is based on programming language, such SOAP, WSDL, UDDI, and XML. As additional, Web services are stateless and utilize standard Internet protocols such as HTTP (Hyper Text Transfer Protocol), SMTP (Simple Mail Transfer Protocol), FTP (File Transfer Protocol), and MIME (Multipurpose Internet Mail Extensions). Means it can provide stable connection and interoperability between application and different platforms (S. Franks, Juri, 2007).
2.8.2 The Characteristic of SOA

The main principle of Service Oriented Architecture supports granularity, composability, standard compliance, reusability, and loose coupling. According to Thomas Earl (2005) Service Orientation principle defined SOA characteristic which is interrelated to each other.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose Coupling</td>
<td>Services maintain a relationship that minimizes dependencies and only requires that they maintain an awareness of each other</td>
</tr>
<tr>
<td>Reusability</td>
<td>Services contain and express agnostic logic and can be positioned as reusable enterprise resources</td>
</tr>
<tr>
<td>Composability</td>
<td>Services are effective composition participants, regardless of the size and complexity of the composition</td>
</tr>
<tr>
<td>Discoverability</td>
<td>Services are supplemented with communicative meta data by which they can be effectively discovered and interpreted</td>
</tr>
</tbody>
</table>

Table 2.4 defined detail characteristic of SOA. According Erl (2005) Loose Coupling achieved toward service contract that allow services to interact within predefined parameters. Service contracts actually tightly couple operations to services. When this service located in operation, other services will depend on operation-to-services. Service contract defines a great deal of the underlying architecture of a solution environment, it provides semantic information that explains how services as part of this solution go about accomplishing a particular task. Meanwhile, SOA can perform reusability. By applying design standard, services will categorize and defined as future requirement in order to minimize service development. (Thomas, 2005)
2.8.3 Enterprise Logic

According to Thomas Erl (2005) Enterprise Logic divides into two segments includes business logic and application logic. Figure 10 represents a specific diagram within three main layers that relates each other and called as enterprise logic. Business logic can be defined as sequential activities or processes that currently documented and implements within the organization. In other hand, Application logic defined as automated implementing business logic that developed and run by technology (Erl, Thomas, 2005).

![Figure 2.7 Enterprise Logic within SOA (Erl, Thomas, 2005)](image)

2.8.3.1 Application Service Layer

Application services, also known as Service Integrator is determine how service should be placed. This allows applications and technology to be involved within this layer. Service Integrator make an outline for existing application that available in the organization and it possibly transforms its functionalities based on business service needs (Erl, Thomas, 2005).
2.8.3.2 Service Interface Layer

Business services provides high-level business functionality throughout the enterprise. This layer provides a service interface abstraction and integration of the layer, breaking the direct dependence between processes and existing systems. (Rosen, Lublinsky, & Smith, 2008)

According to early (2005), service interface encompasses orchestration layer, business service layer, and application service layer. An Orchestration layer consists of process service composed from business service and application service layer, handling with business rules and business logic using the business process definition. Business service layer representing business logic and consist two business service abstraction models, such as entity centric business service and task centric business service. While the application service layer represents specific business technology needs and used utility service or wrapper as part of the application model.

2.8.3.3 Business Process Layer

A business process consists of a series of operations that execute in an ordered sequence according to a set of business rules. They are composed of business services and it encompass multiple service invocations. Business processes operate on business documents.
2.8.4 Business Logic

2.8.4.1 Choreography

Choreography focus on collaborating parties and data exchange (Erl, Thomas, 2005). These approaches provide, exchange message that creates organized collaboration between services that comes from the different service entity.

2.8.4.2 Orchestration

Orchestration contains a controller that coordinates whole activities within the process. Orchestration as centric determines the workflow logic that relates two or more different applications.

![Orchestration Diagram](image)

Figure 2.8 Orchestration provides process service for Partner service, (Erl. Thomas. 2005)

Different processes can be reused to automate the processes. Orchestration worked based on procedure or sequential activities and can be applied in each department and each company (Erl, Thomas, 2005).

2.8.4.3 Collaboration

Collaboration is the most composition that used in several studies. Usually it used or implements together with choreograph, orchestration, or both (Erl, Thomas, 2005).
2.8.5 SOA Delivery Life Cycle

According to Thomas Erl (2005), SOA delivery life cycle is one of SOA development strategic in order to defined standard services. In several research mentions that SOAD methodology perform flexibility toward others methodologies which refers to object-oriented or Business Process Modelling (BPM) approaches. It contains particular step includes:

2.8.5.1 Service Orientation Analysis

In this stage, Service layers are mapped out, and individual services are modeled as service candidates that comprise a preliminary SOA. This stage contains sub-process that need to be done before continued into second step (Erl, Thomas, 2005).
2.8.5.1.1 Define Analysis Scope

Business requirement which is defined in this phase referred to organization needs towards service that want to develop. According to Michael Bell (2006), through service identification, analysis, and design, business abstraction will be delivered through candidate service as solution services. It will includes:

a. Business Impact

b. Service Feasibility

c. Technical Feasibility

2.8.5.1.2 Existing Automation System

This step is more geared to supporting the modeling efforts of larger scaled service-oriented solutions. Means to ensure legacy environment is still useful even it is used in the smaller services (Erl, 2005). Identifying the existing automation system is to provide potential candidate service for company. Michael Bell (2006) mention business service identification will involve:
1 Business Process Analysis, performing value chain analysis and high level process map.

2 Preexisting service, introduce first generation service in production. It will be need to investigate the existing and future service that would be optimized.

3 Existing Business Application, identified business functionalities or existing functionalities. It will used to found process capabilities that can be reused.

2.8.5.1.3 Service Modelling

In this step, model candidate service. The activity within this step is to categorized service operation candidates into logical context. Means, this
candidate will be shaped as services. Within this step, it will break down into more
detail stages that called service modeling. This step includes:

2.8.5.1.3.1 **Decompose business process**

Take the documented business process and break it down into a series of granular
process steps. Process workflow logic be decomposed into the most granular
representation of processing steps, which may differ from the level of granularity
at which the process steps were originally documented.

2.8.5.1.3.2 **Identify operation candidates**

Some steps within a business process can be easily identified as not belonging to
the potential logic that should be encapsulated by a service candidate.

There are two condition during identify operation candidates includes Manual
process steps that cannot or should not be automated and process steps performed
by existing legacy logic for which service candidate encapsulation is not an
option.

2.8.5.1.3.3 **Abstract orchestration logic**

Identify the parts of the processing logic that this layer would potentially abstract.
This step is not compulsory to be implement. Potential types of logic suitable for
this layer include business rules, conditional logic, exception logic, and sequence
logic.
2.8.5.1.3.4  Create service candidates

Review the processing steps that remain and determine one or more logical contexts with which these steps can be grouped. Each context represents a service candidate and decided business service that wants to be created.

2.8.5.1.3.5  Refine and apply service-orientation

Identified the following four key principles as those not intrinsically provided through the use of Web services includes reusability, autonomy, statelessness, and discoverability. These key principles are used to ensure that the service operation candidate potentially can be reused.

2.8.5.1.3.6  Identify service composition

Identify a set of the most common scenarios that can take place within the boundaries of the business process. As a worst case, noted the service operation candidate also defined failure condition that involved exception handling logic.

2.8.5.1.3.7  Revise operation grouping

Revisit the grouping of business process steps and revise the organization of service operation candidates as necessary.

2.8.5.1.3.8  Analyze processing requirement

This next series of steps is optional and more suited for complex business processes and larger service-oriented environments. It requires study the underlying processing requirements of all service candidates to abstract any
further technology-centric service candidates from this view that will complete a preliminary application services layer.

2.8.5.1.3.9 Identify application service operation

Break down each application logic processing requirement into a series of steps.

2.8.5.1.3.10 Create application candidates

Group these processing steps according to a predefined context. With application service candidates, the primary context is a logical relationship between operation candidates.

2.8.5.1.3.11 Revise service compositions

Resulting in the addition of new service operation candidates and perhaps even new service candidates.

2.8.5.2 Service Orientation Design

Service-oriented design is the process by which concrete physical service designs are derived from logical service candidates and then assembled into abstract compositions that implement a business process.

2.8.5.2.1 Compose SOA

Compose SOA will determine detail of SOA pre-design. In this stage, web service technologies will identified based on organization need. This step consists of the following is step consist of initial step includes:
a. Choose Service Layer
b. Position Core Standard
c. Choose SOA extension

2.8.5.2.2 Design Entity-centric business services

Entity-centric business services represent corresponding data entities defined within an organization's business models. These services are strictly solution- and business process-agnostic, built for reuse by any application that needs to access or manage information associated with a particular entity.

a. Review Existing Services
b. Define Entity Schema
c. Derived Abstract Interface
d. Apply Service Orientation
e. Standardize Service Interface
f. Identify Required Processing

2.8.5.2.3 Application services design

Application services are design for implementing utility service. It requires optimized utility service from service interface which support reusable operation.

There are initial step application service design includes:

a. Review Existing Service
b. Confirm Context
c. Derived initial interface
d. Apply service-orientation
e. Standardize service interface
2.8.5.2.4 **Task centric business services design**

Task centric can be found in business service layer and usually under or related with entity centric. Task centric defined as business logic that could not be reused and consider to communicate with application layer. To identify task centric, below are the initial step includes:

a. Define workflow logic
b. Derive initial interface
c. Apply service orientation
d. Standardize Service interface
e. Identify required processing

2.8.5.2.5 **Business Process Design**

Business process design provides high level guidance to represent ws-bpel process definition. Below are detail about service oriented business process design, includes:

a. Mapping intersection scenario
b. Design process service interface
c. Align interaction scenario and refine process definition

2.8.6 **Business Process Management**

Business process can be defined as structural or sequential step or activities within organization to bring specific deliverable outputs. Business process contains several term such as events, activities, and task which is involving several actors
and lead some outcomes value that need to deliver into customers. (Dumas, Marlon, 2012)

2.8.7 Business Process Modelling Language Overview

Business process modelling language represent tools enables analysis, changes to delivered organizational needs. Several related studies concludes that business process modelling language is the most popular research area related with providing useful information through visual diagram (Aldin & Cesare, 2009). According to Korherr (2008), Business process modelling consist of six techniques, such as:

2.8.7.1 Unified Modelling Diagram (UML) Activity Diagram

UML uses a combination of state diagrams, sequence diagrams, collaboration diagrams, and activity diagrams to represent the dynamic behavior of the objects and classes that have been identified as part of the analysis model (Pressman, 2001).

2.8.7.2 Even Driven Process Chain (EPC)

Even Driven Process Chain (EPC) introduces as part of framework ARIS BPM. Basically, Event-driven process chains are used to describe the operational sequence of processes (ARIS, 2009). They describe processes on the level of their business logic, and are targeted to be easy understood and used by business people. An EPC consists of functions, events, control flow connectors, logical operators, and additional process objects. Each EPC consists of one or more Functions and two or more Events (Korherr, 2008).
2.8.7.3 Integrated Definition Method 3 (IDEF3)

IDEF diagrams provide a mechanism for analyzing and documenting processes. They are designed to model decisions, actions and activities of an organization or a system (Vuksic et. All, 2001).

IDEF3 captures the behavioral aspects of an existing or proposed system. Captured process knowledge is structured within the context of a scenario, making IDEF3 an intuitive knowledge acquisition device for describing a system (IDEF3, 2010).

2.8.7.4 Petri Net

A petri net is a mathematical/graphical representation that is appropriate for modelling systems with concurrency (Aldin & Cesare, 2009). Korherr (2008) describes petriNet as directed graph that mainly consists of four elements, namely Places, Transition, Tokens and directed Arcs. Transitions are interpreted as activities, actions or events which cause the change of state.

2.8.7.5 Role Activity Diagram (RAD)

A RAD shows the roles, their component activities, and their interactions together with external events and the logic that determines what activities are carried out when (Geetha, 2006). RAD concludes to provides a different perspective of the process and are particularly useful in supporting communication (Saven, 2003).

According to Koherr (2008) RAD shows Roles, their Activities and Interactions, together with External Events. In RAD an external event, also called a trigger, initialises the begin of a business process.
2.8.7.6 Business Process Modelling Notation (BPMN)

Business Process Management Notation basically design specifically for SOA development. It is well known as visual programming that used can possibly to be translated into Business Process Execution Language. Based on BPMN methods, business process probably contains formal, repeatable, well-structure and may even be automated. This process that generally well known as procedures. Or, it can be provides flexibility, unpredictable, and hard to defined or repeat or this process can be called as practices.

Most of best practices currently used BPMN 2.0 as a guidance from OMG as standard graphical element to design business processes. Figure 2.14 describes the main element of BPMN process known as flow object which is includes activities, events, gateway, and sequence flow.

![Figure 2. 12 Flow object including start event, task, gateway, and end event](image)

According to Stephen A White (2008), Business Process Management Notation have several symbol to describe its function. Below are detail about symbol functionalities, includes:
Activities, represent as rectangle shapes and describes to perform business process. There is several types of activities includes task and sub-process. Activities is possible to reuse by using multi instance activities or process level.

Events, represent as circle shapes and indicates as start, intermediate, or end event depend on types of lines. However events have several functionalities includes: event behavior, the none-n events, timer events, message events, multiple-n events, message events, and conditional events. That functionalities applied to all types of events. An Events can be executes before and after task or process has been done.

Gateway, represent as diamond shapes and describes as alternative path of decision. There is conditional situation, A Gateway splits the flow when it has multiple outgoing sequence flow or single gateway may have both multiple incoming or outgoing sequence flow.

Swim lines, represent as table and used to organize activities diagram. There is two types of swim lines includes pool and lines. Pools represents single participants in collaborative business process diagram. Participant can be referred as general roles, abstract representation, or business entity. Pools known as black box which not show activities or sequence flow inside boundary. While Lane represent internal business roles and usually work together with pools to provide mechanism of generic partition object. However, message flows cannot be execute when pools and lane are working together.

Artifacts, a mechanism for additional information about the process. There are three types of artifacts includes data object, group, and text annotations.
- Connector, represents as line and used to link two or more objects in diagrams. There are three types of connector includes sequence flow, message flow, and associations.
<table>
<thead>
<tr>
<th>Element</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events</td>
<td><img src="image1" alt="Event Notation" /></td>
</tr>
<tr>
<td>Activity</td>
<td><img src="image2" alt="Activity Notation" /></td>
</tr>
<tr>
<td>Gateway</td>
<td><img src="image3" alt="Gateway Notation" /></td>
</tr>
<tr>
<td>Sequence Flow</td>
<td><img src="image4" alt="Sequence Flow Notation" /></td>
</tr>
<tr>
<td>Message Flow</td>
<td><img src="image5" alt="Message Flow Notation" /></td>
</tr>
<tr>
<td>Association</td>
<td><img src="image6" alt="Association Notation" /></td>
</tr>
<tr>
<td>Pool</td>
<td><img src="image7" alt="Pool Notation" /></td>
</tr>
<tr>
<td>Lane</td>
<td><img src="image8" alt="Lane Notation" /></td>
</tr>
<tr>
<td>Message</td>
<td><img src="image9" alt="Message Notation" /></td>
</tr>
</tbody>
</table>

Figure 2. 13 BPMN diagram
2.8.7.6.1 Categories of Process

Same as SOA, BPMN also have three types of processes includes orchestrations, collaborative, and choreograph. Both methodologies, BPMN as visual representation of sequence, and SOA apply BPEL to develop visual representation of conditional logic or codes. It can be concludes that BPMN and BPEL able to supports modelling runtime. According to Stephani A. Whites (2008) the categories of process within BPMN involves:

1. Orchestration

Orchestration represents single coordinating perspectives. BPMN diagram possibly contains more than one orchestration—which perform with one pool. It indicates that one pools contain process element that exist together and well defined. Orchestration are align with web service such BPEL (WhiteStephen & MiersDerek, 2008).

2. Collaborative

Same is compilation between orchestrations and choreograph. It represent between pools and contains message flow and orchestration is an optional to execute within existing pools (WhiteStephen & MiersDerek, 2008).

3. Choreograph

Choreography is sequence of interaction between two participants in a form of exchange messages. Choreography does not exist within a well-formed context and there is no central drive to keep track or monitor choreograph. The used of choreograph perform between two pools (WhiteStephen & MiersDerek, 2008).
2.9 SOA Tools

2.9.1 Microsoft Visio

According to Helmers (2013) Microsoft Visio is the premier application for creating business diagrams of all types, ranging from flowcharts, network diagrams, and organization charts, to floor plans and brainstorming diagrams.

The purpose of using Microsoft Visio is to develop workflow diagrams and develop service modeling that delivers enterprise logic and composition services.

2.9.2 BPMN Intalio

Intalio is a popular BPMN tool. Intalio has three services: Intalio BPMN (for virtual business process and visualization BPEL), Intalio Create (for Rapid Application Development), and Intalio Jetty: // (for Application Server).

In features, Intalio already supports API, Integration, and Connection. It already supports Enterprise Service Bus, Business Rule Engine, and BPMN. Besides, the programming language that it supports includes AJAX, XML, WSDL, REST, SOAP, and SQL.

2.10 Related Studies

In this section, related studies will explain similar or previous research about Service Oriented Architecture, Orchestration, and SOA Delivery Lifecycles. The related studies are used both as fundamental and supporting reference for this research. Table 2.5 and table 2.7 are used as supporting and reference, where the researcher used that reference as fundamental and supporting sources for SOA research. Below is a similar study that used as references, including:
4. Implementation of Service Oriented Architecture for Academic Information System using web services case study: STAI Al-Hikmah Jakarta

The thesis created by Rahmat Budiman (Faculty of Science and Technology, Syarif Hidayatullah State Islamic University, 2013). The result from this research is providing web-service for STAI Al-Hikmah using Spiral methodologies.

The advantages of this research is provide SOA blueprint based on object oriented approach And integrates data information using RPC (Remote Procedure Call) and applied the integration using JSON programming languages. The weakness from this research, the methodology still using object oriented approach caused the candidate service identification not optimal.

5. Business Process Reengineering (BPR) Method for development of Lecturer Curriculum Vitae based on educator certificate templates

The thesis created by Hasan Suroko (Faculty of Science and Technology, Syarif Hidayatullah State Islamic University, 2011). The result of this research is delivered solution by developing Curriculum vitae application which previously is manual processes. However, the weakness from this research is lack of detail description of SOA developments and same as previous research, where the methodology using object approach.

Below is detail comparison between this researches with another research which describes previously, including:
1. This research explain and describes existing system within Academic administration an enrollment where the current system most of application already exist but not all service available.

2. This research using SOA Delivery Lifecycle (SOADL) methodology which is basically purposed for service integration development.

3. This research specifically describes service candidates and its transformation into process definition languages by using BPMN and supports for orchestration development.

4. This research generally will cover the previous research from Hasan Suroko and Rahmat Budiman which is developing SOA using SOA Delivery Lifecycle methodology from service oriented analysis until service oriented design.

5. This research also have related journal (table 2.6) and supporting reference (table 2.7) in order to optimized understanding for SOA Delivery Lifecycle.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nafise Fareghzadeh</td>
<td>2008</td>
<td>Service Identification Approach to SOA Development</td>
<td>The output show case study of designing timesheet submission from workflow diagram, entity model, usecase until create entity centric, task centric, process service, and application service</td>
</tr>
<tr>
<td>Michael Gebhart, Suad Sejdovic, Sebastian Abeck</td>
<td>2011</td>
<td>Case Study for a Quality-Oriented Service Design Process</td>
<td>Performing shortcoming service design process that used as quality indicator.</td>
</tr>
<tr>
<td>Michael Gebhart, Sebastian Abeck</td>
<td>2011</td>
<td>Metrics for evaluating service designs based on SoaML</td>
<td>Perform diagram Modelling service candidates, service interface, message types, service component as a part of quality indicator for service oriented campus guide system</td>
</tr>
<tr>
<td>Aarti Karande, Milind Karande, B.B Meshram</td>
<td>2011</td>
<td>Choreography and Orchestration using Business Process Execution Language for SOA with Web Services</td>
<td>Provides web service manager and comparative workflow between choreography and orchestration within for SOA</td>
</tr>
</tbody>
</table>
Table 2. 6 Supporting Research Reference

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adiprana, Bramasta</td>
<td>2008</td>
<td>Implementation of Business Process Management (BPM) within Service Oriented Architecture</td>
<td>The research topic develops service for submit research proposal by combining SOA Delivery Lifecycle, BPM method and BPMN. The deliverable output from this research is service interface that has design by business process visualization.</td>
</tr>
<tr>
<td>Latuconsina, Roswan</td>
<td>2010</td>
<td>SOA Implementation at PT. Telekomunikasi Indonesia, TBK (Case Study: process of PSB for fixed phone)</td>
<td>The research topic is analyze and design SOA using SOA Delivery Lifecycle. The deliverable output from that research is provides loose coupling SOA. However the research not provides specific service composition for orchestration.</td>
</tr>
</tbody>
</table>
CHAPTER III

RESEARCH METHODOLOGY

3.1 Data Collection Method

Data collection is methodology technique in order to provide information to supports research validity. Data collection techniques involved in this research include observation, literature study, and interview depends on data source like case study and laboratory (Jogiyanto, 2008). In addition, library study is used as a base-knowledge to supports research activities.

3.1.1 Literature Study

Literature study is used as reference to support this research. Several journals, articles, and, books related to SOA and Orchestration development. The theories expect can be used as fundamental research in carrying out analysis and arrange the discussion. Below is the list of book and journal that used to support this research:


e. M. Nicolai, Jossut, (2007), The art of distributed system design (Theory in Practice), O’Reilly MediMiers., Derek, A. White, Stephen A., (2008), BPMN


3.1.2 Library Study

Library study carried out to collecting and comparing several related studies, from previous research or thesis related with Service oriented Architecture and Orchestration. Every research will describes its weakness and contribution to help researcher in comparing current research with another research.

As the result, researcher only have two reference from previous research which is discussing Service Oriented Architecture. Resources that used for comparison involved:

<table>
<thead>
<tr>
<th>Author</th>
<th>Source</th>
<th>Title</th>
<th>Contribution</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budiman, Rahmat</td>
<td>UIN Syarif</td>
<td>SOA for Academic Information System using web services case study: STAI Al-Hikmah Jakarta</td>
<td>Providing web services that support multi-platform.</td>
<td>Development approach that applies during toward the research is used object-oriented UML.</td>
</tr>
<tr>
<td></td>
<td>Jakarta</td>
<td></td>
<td>Provide an SOA blueprint based on object oriented approach And integrates data information using RPC (Remote Procedure Call)</td>
<td>The candidate Service not defined Lack in specific Enterprises logic.</td>
</tr>
<tr>
<td>Suroko, Hasan</td>
<td>UIN Syarif</td>
<td>Business Process Reengineering (BPR) Method for development of Lecturer, Curriculum Vitae based on educator certificate templates</td>
<td>Computerized CV business process into application web based.</td>
<td>The research mention SOA, but not detail for description both in implementation and development.</td>
</tr>
</tbody>
</table>


3.1.3 Interview

The interview contains an existing process which implements within the institution. Another discussion is used to determine expectation, or result regarding the output of IT blueprint.

Besides, the interview was not based on quantitative (using rate or scale) but preferred qualitative, in order to find out whether the existing process has required based on the current system. In other hand, during the interview, the researcher used similar question into different parties, below are the several questions we have already mentioned:

1. How the existing process currently running?
2. is there any part of process that has been automated or running by system?
3. is there any process which actually yet not stated as procedure but in the practice their available?
4. what kind of service that you probably expect to be available for the institution?

The question aboves is specific question that researcher asked to the participant. The result of interview will be attached in appendicies. The interview is held by doing discussion with several parties from Academic Administration Officer such as Mrs. Ir. Yarsi, Mrs. Nuriah, and Mr. MG Hasbullah. And, Finance and Accounting Division such as Mrs. Sulamah, and Mr. Efdison. The reason researcher done interview in two division because both division have similar activities related each other especially in enrollment.
As the result of the interview, concludes that most of business process within institution currently out of dates regarding with every department still renew procedures and developing information system to support the business process itself.

3.1.3 Observation

This research will be held in PUSTIPANDA, State Islamic Syarif Hidayatullah University Jakarta. At that time, the institution are preparing IT blueprint where the end result is IT planning for Enterprise Architecture and SOA Orchestration. Currently, the deliverable output from that blueprint has provide two categorize includes Core business and Supporting business. The result from both business are collection of service that may already exist and should be available for institution in the future.

To implementing SOA Orchestration, Due observation, researcher take some sample process from Enrollment and academic administration (KHS and KRS) from Education and Lecturers services which is a part of Core Business. This service is attempted to integrate with Finance and Accounting which encompasses registration and enrollment payment. Besides, related data that may will be used for this research including:

a. Standard operation Procedure
b. IT Architecture Definition Documentation
c. Interview Result
3.2 Methodology of SOA Delivery Life Cycle

Methodology that will used for orchestration development is SOA Delivery Lifecycle (SOADL). The initial step to implement SOADL is collecting related data that will used to define business requirement and service requirement. Furthermore, both requirement will be used to analysis candidate service and delivered service composition. As the result, the service composition will be simulated into process definition language and service interface design. There are two step in SOADL that will used for this research, involved:

3.2.1 Service Orientation Analysis

In service orientation analysis phases, it will important to define which service that need to develop for Syarif Hidayatullah State Islamic University. The initial step that will carried out in this phase involved:

3.2.1.1 Define Analysis Scope

This section is a part of describing business need within Syarif Hidayatullah State Islamic University Jakarta. As mention before in observation, procedures and Architecture Definition Documentation are used as reference for define analysis scope includes:

1. Identify business impact from specific service that will be develops.

2. Classify technical feasibility from business process that will be analyze.

3.2.1.2 Existing Automation System

This section explain about organization expectation toward SOA Orchestration development. According to Michael Bell (2006) More detail about the result of existing automation system will involve:
1. Perform value chain analysis from institutional requirement needs.

2. Develop high level process map of enterprise.

3. Consider pre-existing service.

4. Identify current service that already available in institution.

3.2.1.3 Model candidate services

3.2.1.3.1 Decompose business process

This phases. The procedure is possible to convert into granular step or workflow process. The purposed from its granular step, to describes logic from workflow itself. The current process will possibly have sub-process. Several step to decompose business process:

1. break down and classified as part of related process until the smallest part

2. categorized candidate service and summerized as primitive business activities.

3.2.1.3.2 Identify business service operation candidates

This section refers to determining which business process that potentially can be performed at candidate service or not. The primitive business activities that previously identified were actually already categorized as a set of candidate’s services. However, this part will detail explain categorizing process to become primitive business activities and manual process identified. The result can be seen in chapter 4.

3.2.1.3.3 Abstract orchestration logic

Orchestration works as controller. The initial step from primitive business activities are used to identify processing logic which defined business rules,
conditional logic, exception logic, and sequence logic. The result of the abstraction can be seen in chapter 4.

### 3.2.1.3.4 Create service candidates

Candidate service can develop based logical context that can collect as processing groups. Its involved Task-centric business service, entity-centric business service, and operation that will used for its candidates. Researcher founds that the based on the observation, UIN Syarif Hidayatullah Jakarta are preferred used business centric services which is combining task centric service and entity centric service. However, the result of process services is yet completed. The result can be seen in chapter 4.

### 3.2.1.3.5 Refine & apply service orientation

This section, the candidate services that has been identified earlier expect to provide service orientation principles such as statelessness, reusability, autonomy and discoverability. Still relates to previous step which mention that the process service are yet complete. Researcher founds that the operation of different entities were actually having similarity task. It, possibly, that similar task can be reused or categorized as a separated task and classified as a part of task centric, or more deeply as utility centric.

### 3.2.1.3.6 Identify service composition

This phase can be a prerequisite as part of identifying potential orchestration pattern. The result from this service composition, perform the service orientation principles.
3.2.2 Service Orientation Design

3.2.2.1 Compose SOA

The compose SOA as mention in literature preview consist of three sub process includes choosing service layers, positioning, core standard SOA, and choosing SOA extensions.

The service layer already defined in the service orientation analysis. These service layer will generate into relevant specification such as XML Schema, WSDL, and, SOAP. To complete the service interface, the service definition will be a part of BPEL and BPMN development.

3.2.2.2 Design Entity-Centric

The entity centric consists of an initial step of developing a service definition. The services that already identified based service composition will be defined here. The deliverable output from this stage is service definition which contains message, types, party, binding, and services interface for entity centric includes in KHS services.

3.2.2.3 Design Application Service

The composition of service definition within the design application service basically will be the same with entity centric, which is includes massage, types, party, binding, and service interface. However, in this section, it will focus on service processing. More details about this section can be seen in chapter 4.

3.2.2.4 Design Task Centric

This stage will classify interaction between one application with another application within one services. The deliverable output from this stage is service interaction
scenario, both in failure and complete scenario, and service income and outgoing message diagrams. The interaction scenario more specific classified interaction between business layer service with the application service layer.

3.2.2.5 Business Process Design

This step almost similar to the whole service definition that explain previously. However. This stage will define interaction between the Service, application services, and actors. Besides the deliverable output from this stage is service interaction and service income and outgoing message. The complete service interface will identified by Business Process Modelling Notation.
3.3 Logical Framework

Figure 3.1 logical Research Framework
CHAPTER IV
SOA ANALYSIS AND DESIGN

4.1 Organization Profiles

Five years before independence day declaration, STI had survived in 1940 until 1942. The organization stand out after japanese occupation had support muslim to found institution of religion and education at Jakarta which is pioneered by Muhammad Hatta and Muhammad Natsir.

In 1950, religion department found Pada tahun 1950-an, Departemen Agama mendirikan Academic of Religion or well known as ADIA as one formation to preparing government employees to receiving diploma or certification as islamic teacher for whole school levels. 1st June 1957 is ADIA days and until now defined as the natalist of Syarif Hdayatullah State Islamic University Jakarta.

In early 1960, PTAIN Yogjakarta expanding their learning area from institutional perspective, department and majority, and composing courses. In order to fulfil organizational needs, ADIA in Jakarta and PTAIN Yogjakarta integrated as national islamic insitutional which is carried out based on PPRI no 111 in 1960, 24 augustus. At that time, PTAIN changed their name to became IAIN Al Jamiah Al Islamiyah Al Hukumiyah and release five demartment including tarbiyah faculty, Adab faculty, Ushuluddin faculty, and shar’i faculty in 9 major cities such as Jakarta, Malang, Yogjakarta, bajarmasin, Palembang, Surabaya, Serang, and, Ujung Pandang.
In 2002 until nowaday, IAIN Syarif Hidayatullah transformed as Syarif Hidayatullah State Islamic University Jakarta and reintebrate knowledge by adding 12 faculties and 48 majorities. The list of faculty includes: Faculty of Tarbiyah and Teaching Science, Faculty of Adab and Humanity, Faculty of Ushuluddin and Philosophy, Faculty of Da’wa and Communication, Faculty of Dirasat Islamiyah, Faculty of Psychology, Faculty of Economy and Business Management, Faculty of Science and Technology, Faculty of Medical and Health Science, Faculty of Social and Political Science, and Post Graduates.

**4.1.1 Organization Vision and Mission**

1. **Vision**

   “Syarif Hidayatullah State Islamic University Jakarta as world class university and excellence in science, Islamic, and Nationality”

2. **Mission**

   a. Produce graduation with competitive advantages in global competition;

   b. Enhance the quality of education to develop and integrating Islamic and nationality;

   c. Enhance the quality of research and service which deliver benefits for sciences and society

   d. Providing good university governance and professional management to manage institution resources that produce excellence service for academia and society;
e. Develops trust and extend the contribution with both national, regional, and international foundations.

3. Goals

a. Preparing colleagues to be citizen, which having academic capability and/or professional that can implement, developing and/or inventing knowledge, religion, social nor science and technology;

b. Develop and disseminate knowledge, religion, social and technology, science and enhance society livelihood and enriched national culture.

4.1.2 Organizational Structures

Figure 4.2 Syarif Hidayatullah State Islamic University Organization Structure, (sources: Pustipanda)
4.1.3 Organization Job and Responsibilities

1. **Advisory Council**

   Advisory council is a forum which consists of public figure and government that take interest toward Syarif Hidayatullah State Islamic development. An advisory Council responsible for giving advice and/or support for institutional advancement and development.

2. **Rector and Vice Rector**

   The rector and vice rector are leadership element for the institution. There are four vice rector that responsible to support the rector encompasses vice rector for academic, vice rector for student affairs, vice rector for institutional development.

3. **University Senate**

   University senate are senior representative and a part of normative agencies for institution and have a man responsible includes:
   
   a. Formulate academic policies and UIN development;
   
   b. Formulate academic assessment and achievement policies and personality development for academic;
   
   c. Formulate consideration and agreement toward budget revenue and expenditure institution submitted to the rector;
   
   d. Assessing Rector responsibility toward applying regulation that implemented;
   
   e. Formulate implemented regulation, academic freedom, and knowledge autonomy for UIN;
f. Giving consideration toward the institution, organizer for candidate lecturers that will be suggested to get promoted as rector and lecturer as candidate for academic level above the rectors;

g. Discipline norms that applied for academic;

h. Brace giving awards for qualified honorably doctoral

4. Faculty

Faculty have duties to coordinate and applied academic activities and/or be professional toward a branch of knowledge, religion, science and technology and/or related art. Within faculty can be consist of many majority and study programs.

5. Post Graduate

Post graduate have duties to applying education and teaching functionalities within Magister and doctoral, research and community service, and collaborate with faculty and/or other agencies.

6. Research institute

Research institution has a duty to implement, coordinating, develops, monitors, and assessing any research activities that held under central research and manage required administrative and resources.

7. Community service institute

The community service institute has duties to implement, coordinating, develops, monitors, and assessing any community service activities that held under community service institute and manage required administrative and resources.
8. **Quality Assurance Agency**

Quality Assurance Agency (LPJM) has duties to do consolidation and accelerate university internal effort toward enhancing or develops quality UIN Syarif Hidayatullah Jakarta, collaborate with the other institutional university.

9. **Bureau of Academic Administration and Student Affairs**

Bureau of Academic Administration and Student Affairs having task to provide administrative services within academic and student within the campus. Bureau of Academic Administration and Student Affairs have functionalities too:

   a. Implementing academic, administrative;
   
   b. Implementing Student and Alumni administrative;
   
   c. Implementing collaboration administrative and becomes coordinator for PTAIS.

10. **Bureau of Planning and Finance**

Bureau of Planning and Finance have duties of providing administrative service relates with planning and finance around the institution. Bureau of Planning and Finance have functionalities too:

   a. Implementing planning, administrative;
   
   b. Implementing financial administration and inventory of state wealth

11. **Bureau of Public administration and Human Resources**

Bureau of Public administration and Human Resources have duties of providing administrative services toward human resources around the
institution. Bureau of Public administration and Human Resources have functionalities to:

a. Implementing public administration;
b. Implementing human resources administration
c. Implementing administration of organizational and governance;

12. Central Library

The library has duties of providing reference services for educational purposed, Research, and community service. Central Library has functionalities too:

a. Provides and managed library material;
b. Procurement and maintenance library material and expanding literature and librarian;
c. Implements collaboration between university libraries and/or with others institutional both national and international.

13. Center for Language

The center for language have functionalities to:

a. Implementing and providing education and teaching of languages.
b. Develops education and teaching programs for languages.

14. IT Center and Database (PUSTIPANDA)

IT center and Database have duties toward system development for the university. The main functionalities are:

a. Development and maintenance of information system;
b. Development and maintenance of networks;
c. Development and maintenance of information system and network services;

d. Develop collaboration for university central computer and information system and/or with others institutional both regional or international;

e. Develops administration for central computer;

4.2 Service Oriented Analysis

4.2.1 Define Analysis Scope

UIN Syarif Hidayatullah as institution to provide competitive scholar which is based on Islamic principle and Tri Dharma. Currently, UIN Syarif Hidayatullah have central web services AIS or well known as Academic Information System (AIS) which manage almost whole academic activities especially in Teaching and Education sector.

<table>
<thead>
<tr>
<th>Business Impact</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>Enables cross majority and support flexibility in time, distance, and content.</td>
</tr>
<tr>
<td>Accountable</td>
<td>Be responsive, reliable toward any references and more secure.</td>
</tr>
<tr>
<td>Scalability</td>
<td>Able to manage based on requirement need.</td>
</tr>
</tbody>
</table>

This scope research will analyze existing business process from academic administration and enrollment. As examples, below are one of business process from academic administration, KHS (Kartu Hasil Studi).
4.2.2.1 Business Process of Education and Lecturing

4.2.2.1.1 Academic Planning

4.2.2.1.1.1 Academic Scheduling

Academic Scheduling is a business process that reviews and discusses courses offered before academic activities begin. Academic Scheduling business process may be related to the KRS request business process, which is based on the student's perspective. On the other hand, academic scheduling is a business process that is based on the faculty or administration's perspective.

Below are the details of the process related to academic scheduling:

- The study program prepares a draft for the courses offered and coordinates with the academic division to discuss course schedules.
- The deliverable output from this discussion includes course schedules and courses that will be offered to students after the KRS request has been opened.
- The course schedule will be distributed based on the decision letter from the dean, which will be delivered to related lecturers.

4.2.2.1.1.2 Curriculum Planning

Curriculum planning describes a business process used to guide implementation toward evaluation and revision of curriculum planning around faculties. Below are the details of the process related to curriculum planning:

- The head of the study program submits the curriculum guidance book and planning to the consortium for validation. If rejected, the study program must revise and submit the guidance.
- After get approved, consortium sent competency standard formulation to study program and receive the competency standard form and basic competencies form

4.2.2.1.1.3 Evaluation of Curriculum

Evaluation of curriculum describes as business process for revise and validate curriculum that need to be upgrade. It probably relates with several business process such curriculum planning and academic activity.

Below are detail step for business process:

- Head of Study Program sent draft curriculum document that will be evaluate into Tim Penyelaras kurikulum.
- The team will check and verify the document. If the draft document has agree, the team will send verification sheet to Head of Study Program and senate. While if the document not yet appropriate, the team will inform to Head of Study Program that the draft need to revise.
- The senate will validate the curriculum evaluation document, the proof that dean has agreed with curriculum is validation sheet. If dean has receive the validation sheet, dean will deliver decision letter into pudek academic. If the senate yet validate, the document will need to recheck and revise.
- Dean of academic who have been receive decision letter will distribute the letter into Head of Study Program. After Head of Study Program receive the letter, they will implement procedure for academic activity.
4.2.2.1.2 Enrollment Management

The new student registration management is a business function derived from the major business functions of Education and teaching. This management of set of activities related transactions student enrollment up to the stage of re-registration.

4.2.2.1.2.1 Administration of Enrollment for New Student

The process for jalur mandiri, that process handle by three actors involves central academic, pustipanda, and finance division. The result from interview and observation, the process takes based on two perspective includes student and back office. Below are detail process description:

- The applicant perform payment for pendaftaran jalur mandiri and receive spmb username and password. The applicant login to spmb sites and fill all the registration form and photos. Then, the applicant submit the form and receive print out of test card.
- Besides, the central academic will monitoring pendaftaran jalur mandiri by receive data of the registrant. The central academic soon will send notification to exam participant for exam ID number, exam schedule and location
- The applicant join the test.
- After all the test is done, then, the central academic input test score for the applicant. They will receive the test result, and data of participant in report.
- The prospective student do reregistration (paying tuition fee, payment validation to faculty, create ID card). Then, join propesa and class.

4.2.2.1.2.2 Administration of Double Degree Registration

Below are detail for process description registration for Double Degree:

- The applicant or UIN student submit permission letter to rector. Then, the committee will checkout document completeness.
- If its complete, the applicant input registration form and submit it.
- The committee will follow up that registration form by print out the permission letter for double degree.
- The applicant or student will do payment to finance division and validate the payment to faculty and join the class.

4.2.2.1.2.3 Administration for Sandwich Registration

Below are detail for process description for sandwich program:

- BAAK receive permission letter and validate complete document. If its complete, BAAK follow up that permission letter and inform student that they already able to input KRS to join class.
- The input KRS will be describes in business process KRS.

4.2.2.1.2.4 Examination for New Student and exam result

The examination business process basically are using for SNMPTN procedure. Besides, the exact business process for PMB, SPMB-PTAIN are yet identified. The to-be business process is expect to provide similar procedure to supports PMB and SPMB-PTAIN examination and preparation. Below are detail for process description for exam preparation:
- Preparation for examination encompasses activity such preparing test room, examiner, question sources, and security.
- The exam is a technical part, the attendance list and report for holding examination will be deliverable output for this step business process.
- The exam result will be calculate using assessment and selection.

4.2.2.1.3 Reregistration Management

Reregistration management are derivative function of main business functions of education and teaching. This management encompass activities related to the validation and verification for current or active students to pursue their academic activity at UIN Syarif Hidayatullah Jakarta. For new student, Management encompasses paying tuition fee and its validation, update related data or information, medical check up, create ID card, and doing propesa.

While for current student, the process only encompasses business process paying tuition fee, payment validation, and request KRS. The reregistration business process also relates with academic supervisor and research supervisor.

4.2.2.1.4 Classroom Management

In this business function, KRS request, attendance management, and input score currently has available in Academic Information System (AIS).
4.2.2.1.4.1 KRS

The KRS in documentation have two version which is sources by central academic and faculty. However, the most valid procedure for KRS comes from by faculty. Details about KRS business process includes:

- Academic administration informing academic schedule for KRS input that must be done by student, lecturer, and study programs.
- Head of study program will input the list of courses from AIS
- Student or college will starting to select the courses based on their semester. The list of courses that already choose by student will be sent into their academic supervisor. It possibly, in observation sometimes students will met their academic supervisor first to discuss about their study plan.
- The academic supervisor check the list of student who request the courses. The academic supervisor will ensure that the courses that student choose was based on standard curriculum. If its already requires, then accept all the request. If its requires, but there are several courses that student taken by repeating the same class because his previous courses were failed, accept. If not, send notification to students about KRS issues which is not match with standard curriculum.
- If all student KRS already accepted, send notification to faculty academic administration to update the courses and print it as courses attendance.

4.2.2.1.4.2 Update KHS

The latest KHS procedure already updated. Below are detail description for business process and its step:
- The student request KHS form in academic division. The KHS form that has been fulfilled, student will submit the KHS form and KHS transcript into secretary of study programs.

- The secretary of study programs will verify and validate the the form and delivered back the form into student. The verification requires if the KHS already requires or match with standard curriculum, accepted it. if not, send notification to central academic to check student KHS.

- Student brings the KHS form to academic faculty administration and central academic to be proceed both in additional courses, updated courses, and delete the courses.

Every business process always have task to be input and must be delivered as output. Based on the whole business process that already describe before, below are detail about deliverable input and output from each business process. Involves:

Table 4. 2 Input and Output data related business process

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
</table>
| Academic Schedule  | a. Input Draft Class Schedule  
|                    | b. Input Draft Course Schedule                             | a. List Course and Schedule offers                          |
| Curriculum Planning| a. Guidance books of curriculum planning and design  
|                    | b. SK & SD form                                            | a. laporan SKL jurusan  
|                    | c. list of code and daftar matakuliah                      | b. laporan daftar matakuliah                               |
|                    | d. roadmap matakuliah                                      | c. draft desain & pengembangan kurikulum                   |
|                    | e. create laporan hasil workshop                          | d. report workshop                                         |
| Curriculum         |                                                            |                                                            |
| Administration for | a. Validate Payment                                        | a. Print Out Examination Id and location                    |
| PMB                | b. Registration Form                                       |                                                            |
|                    | c. Input examination location                              |                                                            |
|---------------------------------|------------------|---------------------|--------------------------------------|------------------------|
| Administration for Sandwich     | a. Submit Permission letter | b. submit approval notification | c. Input data mahasiswa | d. Request KRS form |
|                                 | a. Receive permission letter | b. Generate NIM | c. Attendance list |
| Exam for new student and result | a. Summary report for examination | b. Calculate Assessment test | c. Attendance list | d. Answer sheet | e. Input Score/Result |
| Reregistration (student)        | a. Validate Payment | b. Medical Checkup result | c. (for new student) |
| Input KRS                       | a. KRS form | a. Tuition Payment Report |
| Update KRS                      | a. Form KRS | b. KHS Transcript | c. Standard Curriculum |
|                                 | a. KRS updates |

4.2.2 Existing Automation System

4.2.2.1 Value Chain

![Value Chain Diagram](image)

figure 4. 3 Value Chain of Syarif Hidayatullah State Islamic University
Based on the value chain that already planned, business activity within Syarif Hidayatullah State Islamic University Jakarta will be divide into two business involves Core Business and Supporting Business. Both Businesses will provides application service and contain with collection of module which is relates with specific business functionalities.

The primary activity defined as main activity that related with the main product of the institution. While the supporting activity were focus on back-end service and organizational activities. The primary activity includes:

a. **Education And Teaching for Undergraduates**

Education and Teaching for Undergraduates are main functional business. The activities encompasses functional business such as:

- Registration for prospective student enrollment management which is consist of operational business for registration, exam monitoring, and re-registration both for new student and remain student.

- Education and teaching management encompasses activities relates with academic administration and academic planning.

- Languages management encompasses activities to provides service where the student eligible or qualified for bilingual language capabilities. The service includes TOEFL and TOAFL test, TOEFL and TOAFL preparation, and translation services.

b. **Research**

Research management encompasses functional business includes:

a. Research Management;

b. Journal Management;
c. HAKI management;
d. Textbook management;

c. **Community Service**

Community Service is functional business that compulsory activities for colleges, lecturer, and employee. The functional business includes:

a. CSR management;
b. KKN management;

The supporting activities performing to monitoring and manage primary activities within institution.

**4.2.2.2 High Level Business Functionalities**

Currently, Syarif Hidayatullah State Islamic University already have business functionalities that already categorized from high-level until lower level. In this fundamental research, the identified business functionalities will be develops as application service that we called orchestration.

The orchestration are work based on workflow logic and business rules, business service, and application services. More specific, when the orchestration abstraction such conditional and exception logic has been defined, both logic will be depended on business rules. The business rules can be changed anytime based on enterprise needs. Means, business and application service will be changed as well after business rules. Compare with another approach like collaboration and choreograph, Orchestration is suitable for complex service composition. Figure 4.4 are architecture
landscapes describe how orchestration planned to work includes framework, module, and databases.

Figure 4.4 Architecture Landscape, source: Pustipanda, 2014

Figure 4.5 Business function of Education and Lecturing Level 2, source: Pustipanda, 2014

Orchestration are forms by combination between task centric and entity centric. It also known as business centric approach. Currently, the business functionalities within UIN Syarif Hidayatullah already designed based on
Business Centric approach. However, the SOA orchestration still defined as logical target application architecture and conceptual target architecture but not detail regarding with the analysis and design.

Figure 4.6 Business function of Education and Lecturing Level 3, source: Pustipanda, 2014

Figure 4.7 Business function of Education and Lecturing Level 3, source: Pustipanda, 2014
In another hand, Business Service that already defined in that institution are Education and Lecturing, Research, Community Services, and Supporting. While the business functionalities includes Academic Planning, Management of Registration and Enrollment, Management of Reregistration, Management of Courses, and Management of Graduation. The task centric are yet available, it expected to be available after service modelling identified.

This research done by sampling because the limitation of this research only encompasses Teaching and Education for Undergraduate. Besides, this research will required To-Be process business in order to fulfill organizational needs.

4.2.2.3 Preexisting Business Service

Figure 4.8 describes about application module that need to available in Syarif Hidayatullah State Islamic University Jakarta. This application modules is part of specification of architecture landscape need to develop as the future plan.
4.2.2.4 Existing Business Application

Figure 4.9 describes AIS has integrated with web-application such as scholarship, H2H Bank, PDPT report, Lecturer Monitoring and Evaluation, LKP, and many more. The integration within that application is a part of modules that develops within AIS. In the middle of 2014, intended to expand AIS as e-campus, development of IT blueprint are used involves Enterprise Architecture and Service Oriented Architecture.
4.2.3 Service Modelling

4.2.3.1 Decompose Business Process

The existing business process will be decomposed to business process to represent granularity processing step. When all business processes have already broken down, the business process will be defined as primitive business activity. The purpose of business primitive activity is to identify operation candidates. One business process for one analysis. Below are the result of decomposing the business process into granular steps:
4.2.3.1 KHS

Figure 4.11 KHS Workflow Logic
4.2.3.2 Identify operation candidates

The main idea for identify business service operation candidates are to find out the process manual that could not be automate and identify process that can be used as service. Below are result for identified manual and candidate service from previous decompose process.

However, the existing decompose process are still depends on sub process. to establish orchestration layer, the sub-process need to revise in order to create primitive business activities. The manual process does not mean the process need to terminate. It can also called as process that only can be operate by users. Below are the detail manual and candidate service that already identified, includes:

- The result from academic scheduling workflow identified having sub process that need to break down to be primitive business activities. The sub processes shows that Strategic Planning sub-process are not detail describe because the content are technical activities. It can be concludes, there are four step were removed from academic scheduling.

- Curriculum planning and evaluate Curriculum process showing there is no sub process. However, both process have to removes three manual step.

- In PMB Registration, this process only have one step that need to be drilled down. As the result, there is three step that must be removed and two step need to remove in PMB Admnistration.
Sandwich Administration and Double degree have similar business process which is end up with same activities. However, sandwich administration removed 3 step process manual and double degree removed 2 step process manual.

- PMB exam need to removed 3 step process.
- KHS business process concludes need to removed 3 step process manual, and as the result the automated system consist of 4 process.

Below is detail about which process step which is chosen as candidate service, including:

Table 4. 3 Curriculum Planning – Strategic Planning

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Save documents of Curriculum Planning &amp; Strategic Planning</td>
<td>• Import document of Curriculum Planning and Strategic Planning into system</td>
</tr>
<tr>
<td></td>
<td>• Send document of Curriculum Planning and Strategic Planning</td>
</tr>
<tr>
<td></td>
<td>• If verification document is success, perform retrieve &amp; transform documents; If</td>
</tr>
<tr>
<td></td>
<td>verification document is rejected, end process.</td>
</tr>
<tr>
<td></td>
<td>• Retrieve documents</td>
</tr>
<tr>
<td></td>
<td>• Transform documents into XML</td>
</tr>
<tr>
<td></td>
<td>• If validation for document is valid, perform save process; if invalid, perform</td>
</tr>
<tr>
<td></td>
<td>nothing.</td>
</tr>
</tbody>
</table>
Table 4.4 Curriculum Planning – competency standard form

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Create Competency Standard &amp; Basic Competency form</td>
<td>- If Verification for CS and BC form is appropriate, perform validity checks; if verification is rejected, back to form process OR end process.</td>
</tr>
<tr>
<td>- Print the form</td>
<td>- If Validation for CS and BC form is valid, perform print OR Send the form; if invalid, back to verification process OR end process.</td>
</tr>
<tr>
<td></td>
<td>- Send CS and BC form</td>
</tr>
</tbody>
</table>

Table 4.5 Curriculum Planning – compose list of courses

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Print course list</td>
<td>- Import Course list into system</td>
</tr>
<tr>
<td></td>
<td>- If validation course list is valid, perform Print course list OR save the course list; if invalid, end process.</td>
</tr>
<tr>
<td></td>
<td>- Save the course list</td>
</tr>
</tbody>
</table>

Table 4.6 Curriculum Planning – Courses Roadmap

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Print curriculum planning draft</td>
<td>- Retrieve the course list</td>
</tr>
<tr>
<td></td>
<td>- Transform course list into XML</td>
</tr>
<tr>
<td></td>
<td>- If verification course list is agree, perform compare curriculum documents; if there is no course list, end process.</td>
</tr>
<tr>
<td></td>
<td>- Compare curriculum planning</td>
</tr>
<tr>
<td></td>
<td>- If curriculum has confirmed, perform Send notification to workshop planner and reviewer; if curriculum not confirmed, end process.</td>
</tr>
</tbody>
</table>
### Table 4.7 Evaluation Curriculum

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
</table>
| Confirmation evaluation curriculum documents. | - Retrieve Evaluation Curriculum Documents  
- Transform Evaluation Curriculum documents into XML  
- If verification for document is success, perform confirmation documents; if verification is not success, end process.  
- If validation is valid, perform import Agreement Letter; if invalids, end process.  
- Send Agreement Letter to each department faculty. |

### Table 4.8 Academic Scheduling - penawaran matakuliah

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
</table>
| There is no manual process identified in course offers sub process | - Retrieve course list  
- Transform course list into XML  
- If courses list is valid, continued check metadata; if invalid, end process.  
- If needed, perform metadata; if metadata checking is fails, end process.  
- Send Courses to academic division |
Table 4. 9 Academic Scheduling – Assign Lecturer

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Schedules</td>
<td>- Receive Course</td>
</tr>
<tr>
<td></td>
<td>- Assign Lecturer</td>
</tr>
<tr>
<td></td>
<td>- If schedule is available to the lecturer, perform confirms; if schedule is not</td>
</tr>
<tr>
<td></td>
<td>confirm yet, end process.</td>
</tr>
<tr>
<td></td>
<td>- Update Course Schedules</td>
</tr>
</tbody>
</table>

Table 4. 10 Academic Planning – Meeting Summary

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review course and lecture schedule draft</td>
<td>- Validate Courses Schedule</td>
</tr>
<tr>
<td></td>
<td>- If validation is valid, performs send the schedules; if validation is invalid,</td>
</tr>
<tr>
<td></td>
<td>end process.</td>
</tr>
</tbody>
</table>

Table 4. 11 PMB Administration – Registrant perspective

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login SPMB</td>
<td>- Validate SPMB payment</td>
</tr>
<tr>
<td>Fill Registration Form</td>
<td>- If verification account is success, perform registration form</td>
</tr>
<tr>
<td>Upload Photos</td>
<td>- Validate Registration Form</td>
</tr>
<tr>
<td>Print exam letter</td>
<td>- If validation registration is valid, upload photo; if validation registration is</td>
</tr>
<tr>
<td></td>
<td>invalid, end process.</td>
</tr>
<tr>
<td></td>
<td>- If photo has detected, submit form; if photo not detected, back to validation</td>
</tr>
<tr>
<td></td>
<td>registration form.</td>
</tr>
</tbody>
</table>
### Table 4.12 PMB administration – Processing Registration Forms

<table>
<thead>
<tr>
<th>Manual Process</th>
<th>Candidate Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print data registrant</td>
<td>- Receive registrant form</td>
</tr>
<tr>
<td>Print attendance list</td>
<td>- Retrieve registrant form</td>
</tr>
<tr>
<td></td>
<td>- Transform registrant form</td>
</tr>
<tr>
<td></td>
<td>- If verification is agree, perform import room and exam schedules; if rejected, retrieve the form.</td>
</tr>
<tr>
<td></td>
<td>- Send exam schedule to registrant</td>
</tr>
<tr>
<td></td>
<td>- Send attendance list to examiner</td>
</tr>
</tbody>
</table>

### Table 4.13 Double Degree administration

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceed Requirement</td>
<td>- Submit Permission Letter</td>
</tr>
<tr>
<td></td>
<td>- Validate Permission Letter</td>
</tr>
<tr>
<td></td>
<td>- If validation permission letter is valid, get notification to fill the registration forms; if invalid, send rejection notification</td>
</tr>
<tr>
<td></td>
<td>- If validation form is valid, perform form submission; if invalid, back to registration forms.</td>
</tr>
<tr>
<td></td>
<td>- If notification informs failed, end process; if notification informs pass, perform reregistration step.</td>
</tr>
</tbody>
</table>
### Table 4. 14 Double Degree administration

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print Agreement Letter</td>
<td>- Validate Permission Letter</td>
</tr>
<tr>
<td></td>
<td>- If Permission Letter is required, send approval message; if permission letter is rejected, send rejection message</td>
</tr>
<tr>
<td></td>
<td>- If registration verification is accepted, perform import Agreement Letter; if rejected, perform send rejection notification.</td>
</tr>
<tr>
<td></td>
<td>- Send Notification</td>
</tr>
</tbody>
</table>

### Table 4. 15 Sandwitch administration

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confirm authorization to rector</td>
<td>- Submit Permission Letter</td>
</tr>
<tr>
<td></td>
<td>- Validate Permission Letter</td>
</tr>
<tr>
<td></td>
<td>- If validation permission letter is valid, get notification to fill the registration forms; if invalid, send rejection notification</td>
</tr>
<tr>
<td></td>
<td>- If confirm authorities is accepted, perform proceed requirement; if rejected, end process.</td>
</tr>
</tbody>
</table>

### Table 4. 16 PMB Examination

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance Exam</td>
<td>- If validation for attendance is accepted, perform selection step; if invalid, end process.</td>
</tr>
<tr>
<td>Selection</td>
<td>- If candidates is required, send pass notification; if not, send fail notification.</td>
</tr>
</tbody>
</table>
Table 4. 17 PMB Exam - Receive answer sheet

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input score</td>
<td>- Receive answer Sheet</td>
</tr>
<tr>
<td></td>
<td>- Calculate assessment test</td>
</tr>
<tr>
<td></td>
<td>- Send exam result to academic</td>
</tr>
</tbody>
</table>

Table 4. 18 reregistration - validate payment

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login</td>
<td>- Verify login</td>
</tr>
<tr>
<td></td>
<td>- Import Tuition Payment Report</td>
</tr>
<tr>
<td></td>
<td>- Retrieve Tuition Payment Report</td>
</tr>
<tr>
<td></td>
<td>- If validation payment is valid, performs update financial receipt; if invalid, end process.</td>
</tr>
</tbody>
</table>

Table 4. 19 Input KRS

<table>
<thead>
<tr>
<th>Proses Manual</th>
<th>Kandidat Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login AIS</td>
<td>Verify login</td>
</tr>
<tr>
<td>Check KRS Availability</td>
<td>Check Metadata</td>
</tr>
<tr>
<td>Input KRS Form</td>
<td>Academic Planning</td>
</tr>
<tr>
<td>Edit KRS From</td>
<td>Verify KRS Request</td>
</tr>
<tr>
<td>Check KRS form Request</td>
<td>Send KRS Form</td>
</tr>
<tr>
<td>Receive KRS notification</td>
<td>Receive KRS Request</td>
</tr>
<tr>
<td>Check KRS Status</td>
<td>Send KRS notification</td>
</tr>
<tr>
<td>Print Attendance list</td>
<td>Update Attendance List</td>
</tr>
</tbody>
</table>
Table 4. 20 KHS

<table>
<thead>
<tr>
<th>Input KHS request form</th>
<th>KHS Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input KHS transkip</td>
<td>Send KHS form</td>
</tr>
<tr>
<td>Receive KHS form</td>
<td>Check Validity</td>
</tr>
<tr>
<td></td>
<td>Update AIS</td>
</tr>
</tbody>
</table>

4.2.3.3 Logic Orchestration abstraction

The orchestration abstraction are used to identify which process that have potentially abstract. Means, that this logic orchestration abstraction is used for processing step which relates with BPEL.

Based on the case study, below are detail about orchestration abstraction logic that already identified, includes:

Table 4. 21 Curriculum Planning Abstraction Logic

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Business Rules</th>
<th>Conditional Logic</th>
<th>Exception Logic</th>
<th>Sequence Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Planning</td>
<td></td>
<td>If verification document is success</td>
<td></td>
<td>perform retrieve &amp; transform documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If verification document is rejected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Terminate process.</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>Action 1</td>
<td>Action 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If validation for document is valid</td>
<td>Terminate process.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>if validation for document is invalid</td>
<td>Terminate process.</td>
<td>perform save process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Verification for CS and BC form is appropriate,</td>
<td>Send the form</td>
<td>perform validity checks;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>if verification is rejected</td>
<td>Terminate process.</td>
<td>back to form process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Validation for CS and BC form is valid</td>
<td>save the course list;</td>
<td>perform print</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Validation for CS and BC form is invalid</td>
<td>Terminate process.</td>
<td>back to verification process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If validation course list is valid</td>
<td>Save course list</td>
<td>perform Print</td>
<td></td>
<td></td>
</tr>
<tr>
<td>if validation course list is invalid</td>
<td>Terminate process.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If verification course list is agree</td>
<td>perform compare curriculum documents;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>if there is no course list</td>
<td>Terminate process.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If verification course list is agree</td>
<td>compare curriculum documents;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Process</td>
<td>Business Rules</td>
<td>Conditional Logic</td>
<td>Exception Logic</td>
<td>Sequence Logic</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Curriculum Evaluation</td>
<td></td>
<td>If verification for document is success</td>
<td>confirmation documents</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>if verification is not success</td>
<td>Terminated Process</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If validation is valid</td>
<td>import Agreement Letter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>if validation is invalid</td>
<td>Terminate Process</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. 22 Curriculum Evaluation Abstraction Logic

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Business Rules</th>
<th>Conditional Logic</th>
<th>Exception Logic</th>
<th>Sequence Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>If courses list is valid</td>
<td>check metadata</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. 23 Academic Scheduling Abstraction Logic
<table>
<thead>
<tr>
<th>Academic Scheduling</th>
<th>If courses list is invalid</th>
<th>Terminated process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If metadata is needed</td>
<td>perform metadata;</td>
</tr>
<tr>
<td></td>
<td>If metadata checking is fails</td>
<td>Terminated process</td>
</tr>
<tr>
<td></td>
<td>If schedule is available to the lecturer</td>
<td>perform confirms;</td>
</tr>
<tr>
<td></td>
<td>If schedule is not confirm yet</td>
<td>Terminated process</td>
</tr>
<tr>
<td></td>
<td>If validation is valid</td>
<td>performs send the schedules;</td>
</tr>
<tr>
<td></td>
<td>If validation is invalid</td>
<td>Terminated process</td>
</tr>
</tbody>
</table>

Table 4. 24 PMB Administration Abstraction Logic

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Business Rules</th>
<th>Conditional Logic</th>
<th>Exception Logic</th>
<th>Sequence Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMB Administration</td>
<td>If verification account is success</td>
<td>perform registration form</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If validation registration is valid</td>
<td>upload photo;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>if validation registration is invalid,</td>
<td>Terminated Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If photo has detected</td>
<td>submit form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Process</td>
<td>Business Rules</td>
<td>Conditional Logic</td>
<td>Exception Logic</td>
<td>Sequence Logic</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Double Degree</td>
<td></td>
<td>If validation permission letter is valid</td>
<td>get notification to fill the registration forms;</td>
<td>perform form submission</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If validation permission letter is invalid</td>
<td>send rejection notification</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If validation form is valid</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>if validation form is invalid</td>
<td>Registration forms</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If notification informs failed</td>
<td>Send Notification</td>
<td></td>
</tr>
</tbody>
</table>
### Table 4. 26 Sandwitch Program Abstraction Logic

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Business Rules</th>
<th>Conditional Logic</th>
<th>Exception Logic</th>
<th>Sequence Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Sandwitch Program</td>
<td></td>
<td>If validate permission letter is accepted</td>
<td></td>
<td>get notification to fill the registration forms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If validate permission letter is rejected</td>
<td>send rejection notification</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If confirm authorities is accepted</td>
<td></td>
<td>perform proceed requirement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If confirm authorities is rejected</td>
<td></td>
<td>Terminated Process</td>
</tr>
</tbody>
</table>

### Table 4. 27 PMB Exam Abstraction Logic

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Business Rules</th>
<th>Conditional Logic</th>
<th>Exception Logic</th>
<th>Sequence Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMB Exam</td>
<td>Receive answer sheet</td>
<td>If validation for score is correct</td>
<td></td>
<td>Send score message</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If validation for score is incorrect</td>
<td>End process</td>
<td>Back to Input score step</td>
</tr>
</tbody>
</table>
Table 4. 28 Input KRS Abstraction Logic

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Business Rules</th>
<th>Conditional Logic</th>
<th>Exception Logic</th>
<th>Sequence Logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input KRS</td>
<td></td>
<td>If verification login is true</td>
<td>Go to check validity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If verification login is false</td>
<td>Back to login step</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If check metadata is valid</td>
<td>Academic Planning step</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If check metadata is invalid</td>
<td>Terminated process</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If verification KRS is correct</td>
<td>Send KRS request step</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If verification KRS is incorrect</td>
<td>Edit KRS form step</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If KRS status is approved</td>
<td>Update attendance list step</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If KRS status is rejected</td>
<td>Terminated process</td>
<td>Back to input KRS step</td>
</tr>
</tbody>
</table>
4.2.3.4 Create Service Candidates

The Education and Lecturer business service has several business functions that include academic planning, new student registration management, reregistration for enrollment, course management, and graduation management. Under that business function, there are business processes. The list of business processes has been detailed and categorized based on its business functions.

Every business process that has been converted into a workflow diagram. It can be possible to have different types of entity-centric and task-centric functions. Both of them, during this stage, will have alteration grouping into granular. The clear picture regarding what service is involved in a business process will perform in this stage. More detail below are the list of services that have been categorized based on identified service candidates.
Figure 4. 12 PMB Administration Service Candidates Diagram

Table 4. 30 PMB Administration Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration of PMB</td>
<td>Registration processing</td>
<td>• Verify account</td>
</tr>
<tr>
<td>Registration</td>
<td></td>
<td>• Validate form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• send form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Verify form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Update data form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send exam schedule</td>
</tr>
<tr>
<td>Registration Validation</td>
<td>Validation</td>
<td>• Validate registration payment</td>
</tr>
<tr>
<td>Processing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4. 13 Double Degree Registration Service Candidates Diagram

Table 4. 31 Double Degree Administration Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Degree</td>
<td>Double degree processing</td>
<td>• Submit form</td>
</tr>
<tr>
<td>Administration</td>
<td></td>
<td>• Verify registration form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Retrieve Registrant form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Receive notification</td>
</tr>
<tr>
<td>Permission Letter</td>
<td>Letter Processing</td>
<td>• Retrieve Permission Letter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate permission letter</td>
</tr>
</tbody>
</table>
- Retrieve Approval Letter
- Transform Approval Letter to XML
- Send Approval Letter to Registrant

Figure 4. Sandwich Registration Service Candidates Diagram
Table 4. 32 Sandwich Administration Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandwich Administration</td>
<td>Sandwich Registration</td>
<td>Send Permission Letter</td>
</tr>
<tr>
<td></td>
<td>Processing</td>
<td>Verify Permission Letter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validate Permission Letter</td>
</tr>
</tbody>
</table>

Figure 4. 15 PMB Examination Service Candidates Diagram
Table 4. 33 PMB Examination Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMB Exam</td>
<td>Examination Processing</td>
<td>• Verify Attendance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate Assessment Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate Score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send Exam Result</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send Notification</td>
</tr>
</tbody>
</table>

Figure 4. 16 Reregistration Service Candidates Diagram
### Table 4. 34 Reregistration Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reregistration</td>
<td>Payment validation</td>
<td>- Import Tuition Payment Report</td>
</tr>
<tr>
<td></td>
<td>processing</td>
<td>- Retrieve Tuition Payment Report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Validate Tuition Payment</td>
</tr>
<tr>
<td>Account Receivable</td>
<td></td>
<td>- Update Financial Receipt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Send Message to Financial Division</td>
</tr>
</tbody>
</table>

Figure 4. 17 Academic Scheduling Service Candidates Diagram
Table 4. 35 Academic Scheduling Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Scheduling</td>
<td>Course Treatment</td>
<td>• Retrieve Course</td>
</tr>
<tr>
<td></td>
<td>Processing</td>
<td>• Validate Course</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Submit Course</td>
</tr>
<tr>
<td>Metadata checking</td>
<td></td>
<td>• Check metadata</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate metadata</td>
</tr>
<tr>
<td>Assign lecturer processing</td>
<td></td>
<td>• Receive Course List</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assign Lecturer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Confirm Schedule</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Update Course &amp; Schedule</td>
</tr>
<tr>
<td>CourseSchedule</td>
<td></td>
<td>• Validate Course &amp; Schedule</td>
</tr>
<tr>
<td></td>
<td>Processing</td>
<td>• Send Course &amp; Schedule</td>
</tr>
</tbody>
</table>
Table 4. 36 Curriculum Planning Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service List</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Planning</td>
<td>Curriculum Planner Service</td>
<td>• Import Documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Retrieve Documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transform Documents Into Xml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check Validity Of Curriculum Draft</td>
</tr>
<tr>
<td>Curriculum Standard</td>
<td>Curriculum Standard Competency Form</td>
<td>• Input Form</td>
</tr>
<tr>
<td>Competency Form</td>
<td></td>
<td>• Validate Form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send Form</td>
</tr>
</tbody>
</table>
Figure 4. 19 Evaluate Curriculum Service Candidates
Table 4. 37 Evaluate Curriculum Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate Curriculum</td>
<td>Curriculum Processing</td>
<td>• Retrieve Curriculum Planning Evaluation Documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate Documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Import Agreement Letter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send Agreement Letter</td>
</tr>
</tbody>
</table>

Figure 4. 20 KRS Service Candidates
Table 4. 38 KRS Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRS</td>
<td>KRS Form Processing</td>
<td>• Verify Login</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Verify KRS Request Form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send KRS Request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Validate KRS Request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Send Notification</td>
</tr>
<tr>
<td>Class Processing</td>
<td></td>
<td>• Retrieve KRS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Update Course students</td>
</tr>
</tbody>
</table>

Figure 4. 21 KHS Service Candidates Diagram
Table 4. 39 KHS Service Candidates

<table>
<thead>
<tr>
<th>Business Process</th>
<th>Service Name</th>
<th>Service Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>KHS</td>
<td>KHS form processing</td>
<td>Retrieve KHS form request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validate KHS Form Request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Update AIS</td>
</tr>
</tbody>
</table>

4.2.3.5  Refine And Apply Principles Of Service-Orientiation

In this phase, it preferable to describes services orientation principle that will be used based after deriving business services. The orchestration have characteristic such as composability, extensibility, and vendor diversity. The composability has describes to provides effective composition participant and supports for complexity. More specific, composability also it support interoperability between identified composition member and service reusability. Below are detail service that will implements composability.

- The registration payment validation and reregistration payment validation are actually the same process that retrieve payment data. This services can be reused as payment validation services.

- The registration form from PMB and Double degree services have similar application that related with data input into databases. Both services can interact will one application of registration form.

- Double degree and sandwich services have similar data input in letter submitting and request. Both services possibly communicate with same application letter management application.
- The process service such as Academic Scheduling Process Service and Curriculum Planning Process Service have similar activities relates with retrieving Course activities, the related business services inside both process service can used same application in retrieving course activities.

- KHS form processing actually a part of application and need to develop separately as application service.

The result of all this step will be reveal in the next step.
4.2.3.6 Identify Service Composition

Figure 4. 22 Service Composition Result
Orchestration layer classified as business non-agnostic. The overall services possibly classified as application service layer. However, in this case, service could not be erase, in another hand, service can be reused for another process services. The result from previous step will become service composition. The previous service candidate only identified orchestration layer and business service layer. While in this stage will identify application service layer. this application layer are breakdown after refine service orientation. When there is entity centric contains similar operation it will breakdown into part of application service layer. It will enables another entity or task centric communicate with others application services from different process services.

Figure 4. 23 KHS Service Compostion
Table 4. 40 List of Operation Service for KHS Process Service

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>KHS Process Service</td>
<td>Orchestration</td>
<td>GetKHSID</td>
</tr>
<tr>
<td>KHS</td>
<td>Entity Centric</td>
<td>submitKHS</td>
</tr>
<tr>
<td>KHS Reporting</td>
<td>Utility Service</td>
<td>GetKHSReport validateKHS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>checkCurriculum VerifyKHS</td>
</tr>
<tr>
<td>Insert KHS</td>
<td>Utility Service</td>
<td>GetKHSform</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GetCurriculum GetTranscript</td>
</tr>
</tbody>
</table>

Figure 4. 24 PMB Administration Service Composition
Table 4. 41 List of Service Operation for PMB Administration Process

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMB Administration Process Service</td>
<td>Orchestration Service Layer</td>
<td>- GetUserID</td>
</tr>
<tr>
<td>Registration Service</td>
<td>Entity Centric</td>
<td>- GetRegistrationForm</td>
</tr>
<tr>
<td>Registration Payment Validation Service</td>
<td>Task Centric</td>
<td>- GetRegPayment</td>
</tr>
<tr>
<td>UserDataAccess</td>
<td>Utility Service</td>
<td>- verifyAccount</td>
</tr>
<tr>
<td>Registration Form Utility Service</td>
<td>Utility Service</td>
<td>- validateForm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- GetRegistrantReport</td>
</tr>
<tr>
<td>Exam Schedule</td>
<td>Utility Service</td>
<td>- GetSchedule</td>
</tr>
<tr>
<td>Retrieve Payment Report Utility Service</td>
<td>Utility Service</td>
<td>- transformToNative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformtoXML</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- GetPaymentReport</td>
</tr>
<tr>
<td>Notification</td>
<td>Utility Service</td>
<td>- Send Notification</td>
</tr>
</tbody>
</table>
Table 4.42 List of Operation Service for Double Degree Process Service

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMB Double Degree Registration Process Service</td>
<td>Orchestration Service Layer</td>
<td>- GetRegistrantID</td>
</tr>
<tr>
<td>Letter Service</td>
<td>Entity Centric Layer</td>
<td>- SubmitLetter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- CompareLetterType</td>
</tr>
<tr>
<td>Registration Form</td>
<td>Utility Service</td>
<td>- validateForm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- GetRegistrantReport</td>
</tr>
<tr>
<td>Retrieve Permission Letter</td>
<td>Utility Service</td>
<td>- GetLetter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformToNative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformtoXML</td>
</tr>
<tr>
<td>Retrieve Approval Letter</td>
<td>Utility Service</td>
<td>- GetLetter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformToNative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformtoXML</td>
</tr>
<tr>
<td>Notification</td>
<td>Utility Service</td>
<td>- SendNotification</td>
</tr>
</tbody>
</table>
Figure 4.26 Sandwitch Registration Service Composition

Table 4.43 List of Operation Service for Sandwich Registration Process

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandwich Program</td>
<td>Orchestration Service Layer</td>
<td>GetRegistrantID</td>
</tr>
<tr>
<td>Process Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter Service</td>
<td>Entity Service Layer</td>
<td>- SubmitLetter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- CompareTypeLetter</td>
</tr>
<tr>
<td>Retrieve Permission Letter</td>
<td>Utility Service</td>
<td>- GetLetter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformToNative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformtoXML</td>
</tr>
</tbody>
</table>
Retrieve Approval Letter

Utility Service

- GetLetter
- transformToNative
- transformToXML

Notification Utility Service
- Send Notification

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMB Examination Process Service</td>
<td>Orchestration Service</td>
<td>- GetExamID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- GetRegistrantID</td>
</tr>
<tr>
<td>PMB Examination Service</td>
<td>Entity Centric Layer</td>
<td>- SubmitAnswer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- submitAttendance</td>
</tr>
<tr>
<td>PMB Selection Service</td>
<td>Entity Service Layer</td>
<td>- InsertScore</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- SelectCandidates</td>
</tr>
</tbody>
</table>
| PMB Reporting | Utility Service | - RegistrantDataReport  
|               |                 | - ExaminationReport  
| Update Exam    | Utility Service | - GetExamSchedule     
| Schedule       |                 | - UpdateSchedule      
| Answer Sheet   | Utility Service | - RetrieveAnswer       
|                |                 | - CheckAnswer         
| Verify Attendance | Utility Service | - RetrieveAttendance   
| Input Score    | Utility Service | - GetScore            
| Retrieve Payment | Utility Service | - GetPaymentReport     
| Report         |                 | - transformToNative   
|                |                 | - transformToXML      

Figure 4. 28 Reregistration Service Composition
Table 4. 45 List of Operation Service for Reregistration Process Service

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reregistration Process</td>
<td>Orchestration Service</td>
<td>- GetStudentID</td>
</tr>
<tr>
<td>Service</td>
<td></td>
<td>- GetPaymentID</td>
</tr>
<tr>
<td>Account Receivable Service</td>
<td>Entity Centric Service</td>
<td>- UpdateAR</td>
</tr>
<tr>
<td>Payment Validation Service</td>
<td>Task Centric Service</td>
<td>- UpdateValidation</td>
</tr>
<tr>
<td>Retrieve Payment Report</td>
<td>Utility Service</td>
<td>- GetPaymentReport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformToNative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- transformtoXML</td>
</tr>
</tbody>
</table>

Figure 4. 29 Academic Scheduling Service Composition
<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Scheduling</td>
<td>Orchestration Service</td>
<td>getDocumentID</td>
</tr>
<tr>
<td>Process Service</td>
<td>Layer</td>
<td></td>
</tr>
<tr>
<td>Course Treatment Service</td>
<td>Entity Centric Service</td>
<td>- AddListCourse</td>
</tr>
<tr>
<td>Assign Lecturer Service</td>
<td>Task Centric Service</td>
<td>- AddLecturer</td>
</tr>
<tr>
<td>Retrieve Course</td>
<td>Utility Service</td>
<td>- GetListCourse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- UpdateCourse</td>
</tr>
<tr>
<td>ClassReporting</td>
<td>Utility Service</td>
<td>- GetClassReport</td>
</tr>
</tbody>
</table>

Figure 4. 30 Curriculum Planning Service Composition
Table 4. 47 List of Operation for Curriculum Planning Process Service

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum Planning Process Service</td>
<td>Orchestration Service</td>
<td>GetCurriculumID</td>
</tr>
<tr>
<td>Curriculum Planner Service</td>
<td>Entity Centric Service</td>
<td>UpdateCurriculum</td>
</tr>
<tr>
<td>Course List service</td>
<td>Entity Centric Service</td>
<td>AddCourse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UpdateCourse</td>
</tr>
<tr>
<td>Course Schedule</td>
<td>Task Centric Service</td>
<td>AddCourseSchedule</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UpdateSchedule</td>
</tr>
<tr>
<td>Curriculum Form</td>
<td>Utility Service</td>
<td>updateCurriculumForm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>validateform</td>
</tr>
<tr>
<td>Curriculum Report</td>
<td>Utility Service</td>
<td>GetSKLReport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UpdateCourse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>workshopReport</td>
</tr>
</tbody>
</table>
Figure 4.31 Evaluate Curriculum Process Service

Table 4.48 List of Operation for Evaluate Curriculum Process Service

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate Curriculum</td>
<td>Orchestration</td>
<td>GetCurriculumID</td>
</tr>
<tr>
<td>Process Service</td>
<td>Service</td>
<td></td>
</tr>
<tr>
<td>Agreement Letter</td>
<td>Entity Centric</td>
<td>SubmitAgreementLetter</td>
</tr>
<tr>
<td>Retrieve Document</td>
<td>Utility Service</td>
<td>transformDocuments</td>
</tr>
</tbody>
</table>
### Figure 4.32 KRS Process Service

#### Table 4.49 List of OPeration for KRS Process Service

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Composition Layer</th>
<th>Identified Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRS Process Service</td>
<td>Orchestration Service</td>
<td>GetKRSID</td>
</tr>
<tr>
<td>KRS</td>
<td>Entity Centric</td>
<td>submitKRS</td>
</tr>
<tr>
<td>KRS Reporting</td>
<td>Utility Service</td>
<td>GetKRSReport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>validateKRS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>checkCurriculum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VerifyKRS</td>
</tr>
<tr>
<td>Insert KRS</td>
<td>Utility Service</td>
<td>GetKRSform</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GetCourseRequest</td>
</tr>
</tbody>
</table>
4.3 Service-Orientation Design

4.3.1 Design Entity Centric

Design Entity Centric can be found in business service layer in service interface. The entity centric can be describes as services that can be reused from the existing process services.

As mention in previous chapter 3 methodology, the entity centric step will define XML schemas, service interface, and apply service orientation. The use of designing entity centric is to manage information from identified application that supports within process services.

4.3.1.1 Existing Services

![Diagram of Identified Entity Centric Services]

Figure 4. 33 List of Identified Entity Centric Diagram
Figure 4.14 is the list entity centric which can be found in business service layer. Previously already identify as part of service composition in previous phases. However, the operation still need improvement in order to validate whether there is operation that still can break down as task centric and application services.

4.3.1.2 Message Schema Types

In another chance, researcher tried to build task centric for KHS as experiment to develop design centric. The examples figures of xml schemas, service interface, binding, and message are built to perform service orientation for KHS can be seen in the next figure.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://www.w3.org/2001/XMLSchema"
    targetNamespace="http://www.example.org/KHSchema"
    xmlns:tns="http://www.example.org/KHSchema"
    elementFormDefault="qualified">

  <element name="Input">
    <complexType>
      <sequence>
        <element name="ID" type="string"></element>
        <element name="name" type="string"></element>
        <element name="faculty" type="string"></element>
        <element name="prodi" type="string"></element>
        <element name="khslist" type="string"></element>
        <element name="notes" type="string"></element>
      </sequence>
    </complexType>
  </element>

  <element name="result">
    <simpleType>
      <restriction base="string"></restriction>
    </simpleType>
  </element>

</schema>
```

Figure 4. 34 Schema for KHS
Figure 4. 35 import services for submit KHS process

```
<wsdl:import namespace="http://www.intalio.com/gi/KHSRequest.gi"
  location="KHSRequest.gi.wsdl"/>
<wsdl:import namespace="http://www.intalio.com/gi/KHSValidation.gi"
  location="KHSValidation.gi.wsdl"/>
```

Figure 4. 36 Message and PortType for Submit KHS Services

```
<wsdl:message name="SubmitKHSRequest">
  <wsdl:part element="tns:SubmitKHS" name="parameters"/>
</wsdl:message>
<wsdl:message name="SubmitKHSResponse">
  <wsdl:part element="tns:SubmitKHSResponse" name="parameters"/>
</wsdl:message>
<wsdl:portType name="submitKHS">
  <wsdl:operation name="SubmitKHS">
    <wsdl:input message="tns:SubmitKHSRequest"/>
    <wsdl:output message="tns:SubmitKHSResponse"/>
  </wsdl:operation>
</wsdl:portType>
```

Figure 4. 37 examples of binding for KHS Services

```
<wsdl:binding name="WFmagic_DkzIB01EeSccqDPiSsJegServiceBinding" type="KHSValidation1:Process">
  <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http">
    <wsdl:operation name="initProcess">
      <wsdl:input name="initProcessRequest">
        <soap:body use="Literal"/>
      </wsdl:input>
      <wsdl:output name="initProcessResponse">
        <soap:body use="Literal"/>
      </wsdl:output>
    </wsdl:operation>
    <wsdl:operation name="notifyTaskCompletion">
      <wsdl:input name="notifyTaskCompletionRequest">
        <soap:body use="Literal"/>
      </wsdl:input>
      <wsdl:output name="notifyTaskCompletionResponse">
        <soap:body use="Literal"/>
      </wsdl:output>
    </wsdl:operation>
  </soap:binding>
</wsdl:binding>
```
4.3.1.1 Revised Operation Service

There are several services which actually a part of application and task centric. When it revised based on application and operation services, we found that this application can be considered as entity centric and task centric.

For instance, previously payment validation service were classified as entity centric and account receivable service used as application services. After revising application and operation services, the account receivable actually a part of task centric. It concludes possibilities operation within both entity centric and task centric contains same or similar operations that classified as application service layer. The identified application layer for both services is RetrievePaymentReport.

Figure 4. 38 Revise entity Centric
4.3.2 Design Application Service

4.3.2.1 existing services

Design Application Service is part of service interface logic. As the continuation from entity centric design where application will rely on parent controller to define more specific business process task.

![Figure 4. 39 List of Application Service Diagram](image)

4.3.2.2 Revised Operation Service

The previous service composition in service orientation analysis shows each process service already define application service. However, each application service found they have similar activities. Below are details of description for application services.
- Retrieve permission letter and retrieve approval letter are similar activities which done by import and export document. Means, this kind services can be reused into one application as “Transform Letter” or “Retrieve Letter”.
- The same things will be apply to several application such as Retrieve payment report represent validation payment from registration payment and tuition payment. Retrieve document in curriculum planner.
- getMetadata, Notification, and verify account are additional application service for each process services.

Figure 4. 40 Revise Application Service
4.3.3 Design Task Centric

4.3.3.1 Define the workflow logic

The purpose of define workflow logic is to find out which application service that will communicate with task centric. It will need two condition, successful and invalid scenarios. The valid scenario describes if the process running successfully. The invalid scenario will be carried out if the request failed while tried to reach application service request. Below is detail about task centric description including:

The task centric of course scheduling processing involved several application service such as curriculum, notification, curriculum form, and curriculum report. If the curriculum already assigned to this service, the course scheduling processing will request validation form which is need to fill by user. If the validation completely filled and successfully submitted. The curriculum will transform the curriculum document as curriculum report and as the result, the curriculum document will be updated.

figure 4. 41 valid course scheduling
Figure 4.41 depicted as situation when course scheduling failed to reach application service. When the system tried to request validation form from course scheduling processing. The system will define condition, if the validation unavailable for service or validation form available but not completely filled, the curriculum form will not perform in this stage.

Figure 4.42 perform successful registration validation processing. The task centric involves application service such as account receivable notification, payment checking, verify account, registration form, and testSchedule.
Registration validation processing also involved application service provided by third party such as H2H in order to delivered transaction report. When the transaction report already successful delivered, registration will started validate by transforming every transaction through payment checking and account verification. If all transactions already match with both application service, system will send notification that process already successfully and activate related account (in this case, it will apply for registrant and current student in the institution) automatically. The document at the same time will delivered to finance application to be followed up based on the application needs.

Figure 4.43 depicted failed or unsuccessful process for registration validation processing. Transformation transaction will be failed when the service is unavailable or does not support.
Assign Lecturer Processing Scenario

Assign lecture processing will involve some application service includes notification, course, and course report. Curriculum service will notify course list and user will start to assign lecturer processing. Course list from curriculum service will get course list and retrieve the document through course application service. In this stage, user will assign lecturer and update course list as course report which is consist of list of schedule and lecturer.
Figure 4. 46 invalid assign lecturer processing scenario

Figure 4.45 depicted failed or unsuccessful process for assign lecturer processing. User will unable to assign any lecturer if there is no curriculum submitted to the application services.
figure 4.47 course roadmap processing successful

Figure 4.46 depicted as course roadmap processing. When curriculum start course roadmap service, the application will retrieve course list within curriculum. If retrieving the courses is failed, there will be notification if the application unable to get all the course list. The failure course roadmap processing can be seen in figure 4.45.

figure 4.48 course roadmap processing failure
Course roadmap processing and course treatment processing (figure 4.46 and figure 4.47) basically have similar process. Both task centric also retrieving course. However, both task centric have different process service.

**Figure 4.49** Course treatment processing successful

**Figure 4.50** Course treatment processing failure
4.3.3.2 Service Interface Interaction

Task centric is identified based on entity centric. It would be classified as part of the business service layer. Typically, task centric is a service that could not be able to reuse.

Based on study case, the result of task centric founds after entering service orientation design. Previously, there are several last steps from service orientation analysis that yet defined because it was optional step which is can be reviewed in the service orientation design.

As the result, revisiting the service composition to classify which service that's possibly identified as task centric and founds there are eight tasks centric includes Course Schedule, Account Receivable, Letter, assign Lecturer, course roadmap, course treatment, curriculum standard, and course list.

The identified task centric, expect to provide service scenario using sequence diagrams to find out service successful and failure during its execution.

Figure 4. 51 Revise Task Centric
4.3.4 Design Process Service

The necessary part of SOA is interaction business process which transforms into BPEL (Business Process Execution Language). When a user would like to use web services, automatically, they will invoke the web services.

Figure 4.52 web service composition UIN Syarif Hidayatullah Jakarta

Figure 4.58 describes the general process of web services for UIN Syarif Hidayatullah Jakarta. The flow of the composition describes when the client request for business process within the institution. BPEL will generate the selected activities. If UIN Syarif Hidayatullah Jakarta has another partner, in
this case the partner already support web service, UIN Syarif Hidayatullah already provided it.

It describes how web service will interact with the actors. This case study will focus on BPMN design for several business processes which already done by service composition. As the result, every business process will supported by web services. To find out how the process service that already determined previously, the sequence diagram is used to simulate the interaction between related services that communicates with process service itself. The activity diagram has divided into two scenarios includes failure activities and accepted activities.

4.3.4.1 Map out interaction scenario

Below are results from several process services for PMB Registration, PMB Examination, Reregistration, KRS, and KHS. As the result from the sequence diagram, the context diagram for incoming and outgoing message will be found and used for designing the process service interface.

Figure 4. 53 valid process scenario for KHS
Figure 4.53 is KHS interaction scenario. There are 3 actors involved in this activity, including student, study programs, and academic officer. The process requires for activity which is happening after student done with their enrollment payment. It possibly involved with another process service from finance. However, this process service focuses on business registration process. Started with H2H bank will send documents through registration process services. The document later on will transformed, and payment validation service will retrieve documents to get Payment and automated send payment validation check. The document also through account receivable to update data and automatically transform the transaction. In advance, the document automatically will update registration validation service by comparing validation transaction and if has been done, it will send notification to the student as activation confirmation.

Figure 4.54 Valid Process Scenario for Reregistration

Figure 4.53 is a reregistration process service. There are 4 actors involved in this activity, including H2H bank, student, academic, and finance. The
process requires for activity which is happening after student done with their enrollment payment. It possibly involved with another process service from finance. However, this process service focuses on business registration process. Started with H2H bank will send documents through registration process services. The document later on will transformed, and payment validation service will retrieve documents to get Payment and automated send payment validation check. The document also through account receivable to update data and automatically transform the transaction. In advance, the document automatically will update registration validation service by comparing validation transaction and if has been done, it will send notification to the student as activation confirmation.

Figure 4. 55 valid Process Scenario for KRS

Figure 4.54 is KRS process scenario. There are 3 actors involved in this activity, including student, study program, and lecturer. The process requires
for activity which is happening after student receive activation status and payment validation. Begin with student submit KRS request from KRS process service. The KRS process service will retrieve and update the database by performing GetListCourse to KRS service. After getListCourse success, then it will transform into KRSReport that will manage by study program and lecturer.

![Figure 4.56 valid Process Scenario PMB Registration](image)

Figure 4.56 explains valid process PMB Registration. The activities require when participant already gets password and username after they paid registration fee. When participant already verifies login, it will perform checkuser. If the account is valid, the participant will get field the registration form. After that, the participant will validate registration form and receive registration confirmation through registration validation. As the result, the participant will direct to the exam schedule service where they will getSchedule for the examination which is input by academic officer.
Figure 4.57 valid Process Scenario Double Degree

Figure 4.56 explains valid process Double Degree. The activities require when a participant is available for active student and intended to have a double degree. Also, the participant already knows about double degree term and condition. It started with registrant submit registration form through process service and it will generate and GetRegistration form updated into double degree registration service. The registrant requires to submit a permission letter and will add into letter service. The system will classify the letter from registrants as permission letter. The registration form will be validated through validation registration and deliver confirmation letter.

Figure 4. 58 valid process scenario for Sandwich Programs
Figure 4.57 shows the valid scenario for sandwich programs registration. The process almost similar with double degree programs. It requires students to know the term and condition for sandwich programs. The actor who involved in this activity includes the registrant, academic, and financial. Not like double degree, which requires registration forms. Sandwich program registrant only submits permission letter through sandwich registration process service, later on the permission letter will added to the database and categorized as permission letter. The letter will transform as document to academic and perform notification if there is new letter submitted.

Below is the result from previous interaction which is described as income and outgoing message. It possibly has different outgoing message, if the interaction being generates as xsd schema which cause additional or new outgoing message will be involved.

Figure 4. 59 Incoming & Outgoing Message KHS
4.3.4.2 Design The Process Service Interface

In this phases, the operation within process service that already mention in previous stage, incoming and outgoing message flow will be generated into wsdl definition. In this case, the wsdl definition are
develops by using intalio BPMS tools. To run the programs, researcher simulated validation form activities using AJAX form which has includes intalio tools.

Figure describes the result of KHS process service which is previously known as service composition, develop in BPMN. Researcher only enabled to define two actor in KHS process service includes academic and students which can be seen in two pools with grey tables—means two pools can be access by another parties.

Based on previous step, entity centric located in getKHS task. While the application service describes as web service pools which is manage all activity toward income and outgoing message from two actors. It possible if we would like to add another task by assign new pool as new actor and add another task. However, in order to run all this bpmn into programs, each task provides variable that need to connect each other. This variable will be assigned based on gateway and task that manage income and outcome message. In other hand, the wsdl will be assign within one task. For instance, in KHS process service, the wsdl will be assign in invoke task. Without wsdl, all bpmn unable to run although the system enables to deploy it. When the service running, the form may will appear but could not be sent since there is no processing programming to run that forms.

Thing about wsdl and bpmn which is explain previously also apply to another process service that already develop.
Figure 4.62 depict KHS Business process modelling notation. Starting with user student sending form request to KHS web service. After the student submit the form request, the web service will processing the request through the ‘INVOKE’ task. Within this task consist of ‘SUBMIT’ processing task where the form will assigned and delivered to study program as KHS validation. The WSDL which is previously mention was include in ‘SUBMIT-KHS’ task. The task consist of XSD schema about data that need to input. However, before through the next task, invoke task need to check by gateway (x sign). The gateway have task to declare condition for each task. In this case, if KHS form is fulfilled, then sent message to study program user. If form is empty then terminate the process. When the form processing is successful, study program user will receive form notification list to proceed. If the form request already validated, KHS will be validate by web service through gateway, if form is already filled correctly, terminate process.

Figure 4.63 BPMN diagram for KHS Process Service
Figure 4.64 depict as PMB Registration. Getting started with registrant request registration form through PMB web service. After the registrant verify the registration form, the system will check whether the identified task including photo, related document, biography, majority and exam package already filled completely. It will put condition if one of form is not complete, then terminate process. If all the form is fulfilled, then invoke the data to validate. If registration validation is successful, send registration form to registration manager web service.

In registration manager web service, the system will retrieve all the data of registrant and categorized every data based on majority and exam package. If the categorization has done, the web service will perform schedule form request and will distribute all the form to the all registrant.
Figure 4. 65 BPMN design for PMB Registration
Figure 4.66 BPMN Design for Double Degree

Figure 4.65 depict as double degree business process modelling notation. The actor in this system consist of two actor involved registrant and academic. While the web service named as double degree registration. Starting with sending form request registration. After registrant successfully submit form which is contain with permission letter, the service will categorized it based on type of letter. The registrant will check majority and it will store to database. The registration form later on will notified to double degree administration.
Figure 4. 67 BPMN design for Reregistration
Figure 4.68 KHS Form Request

Figure 4.69 KHS Validation Form
Figure 4. 70 KHS Processing Form

Figure 4. 71 the result after deployment successful
Figure 4. 72 Categorizing Roles

Figure 4. 73 User Identifier for Student, Prodi, and academics
Figure 4. 74 identified modules for students

Figure 4. 75 login user interface
4.3.4.3 Constraint during Process Service Design

During designing process design using intalio community. Generally, the main idea of orchestration was business rules that used to running the business process services. In this case, the intalio community does not support business rules because it was limited features. The business rules can be defined and running using intalio enterprise or full version.

In another chance, researcher found several application that may supporting business rules includes: OW Orchestration, Bonita, and Jboss ESB. Those application was support to develop business rules.

To develops business rules it will requires several element such as WSDL, XSD Schema, and, Java programming. While for designing user interface, it will need AJAX programming language.
CHAPTER V
CONCLUSION AND RECOMENDATION

5.1 CONCLUSION

Below is the conclusion of this research based on previous chapter, including:

a. Researcher founds that there are several process services already available due analyzing and design SOA approach. Most of academic administration service and enrollment service already run by system. However, KHS business process founds still manual and need to automate.

b. This research focus on service oriented analysis and design for business process in academic administration and enrollment in Syarif Hidayatullah State Islamic University Jakarta.

c. The result of service oriented analysis and design is service composition and business process definition. Perhaps it can be used as reference guide for institution such as Syarif Hidayatullah State Islamic University Jakarta in order to implementing service oriented architecture.
5.2 RECOMMENDATION

This Research possibly still have many weakness. Below are detail recommendation for further research involves:

a. The next research may can add details about business rules which is not prominent in this research.

b. The scope of this research still encompasses academic administration and enrollment. The further research development perhaps can cover all department within Syarif Hidayatullah State Islamic University Jakarta.

c. This research still need to revalidate, considering about the business process modelling that keep changing. Thus, this research only focus on one business process in one department which caused the interoperability does not visible at all.

d. In the next research, SOA Delivery Lifecycle (SOADL) phase should be pursue into implementation until service administration in order to optimized service development.
References


Christensen, E., Curbera, F., Meredith, G., & Weerawarana, S. (2001). *Web Services Description Language (WSDL) 1.1*.


APPENDIX I
(PRIMITIVE BUSINESS ACTIVITY)
Appendix I. 1 Curriculum Planning Workflow Logic
Appendix I.2 Primitive Business Activity of Curriculum Planning
Appendix I. 3 Evaluate Curriculum Workflow Logic
Appendix I. 4 Academic Scheduling Workflow Logic
Appendix I. 5 Primitive Business Activity of Academic Scheduling
Appendix I. 6 PMB Administration Workflow Logic
Appendix I. 7 Registration for Sandwich Program Workflow Logic
Appendix I. 8 Registration for Double Degree Workflow Logic
Appendix I. 9 Primitive Business Activity Registration for Double Degree
Appendix I. 10 PMB Examination Workflow Logic
Appendix I. 11 Primitive Business Activity of PMB Examination
Appendix I. 12 KRS Input Workflow Logic
APPENDIX II

(INTerview)
## INTERVIEW RESULT

### ACADEMIC DIVISION

<table>
<thead>
<tr>
<th>Dates of interview:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part I</strong> : Monday, 21st April 2014 (Head of Academic Division – Mrs, Ir. Yarsi Berlianti)</td>
</tr>
<tr>
<td><strong>Part II</strong> : Friday, 25th April 2014 (Enrollment Division – Mrs. Nuriyah, MM)</td>
</tr>
</tbody>
</table>

Interviewed by: Widyastuti Puspita Wijaya

### Interview Part I

Regarding with several procedures, is there any latest procedure that need to be updated?

*Currently we still doing revision for the academic operation procedure. After read the list of sop you mention before, most of them currently still in discuss to be updated. The latest procedure that I most remember was Converting score for the student. Detail about converting score includes:*

- Student submits permission letter for score conversion to department or faculty.
- Head of department will receive to confirm related courses to convert
- Head of department invokes score conversion to BAAK or Vice Rector of Academic
- BAAK or vice rector confirm score conversion
- Student visit Finance Division to pay score conversion.
- BAAK will input score conversion.
While the procedure for requesting and KRS request and update includes:

Student who has been enroll new courses and receiving score but repeating the class because failure, student need to validate new score to department study and deliver score updating through Faculty academic administration. Then, BAAK will receive the document to updating score.

Score Transcript

- Academic send notification date expired about 10 days for lecturer to submitting score.
- Lecturer submitting score by filling score form after done with final exam semester.
- Lecturer submit the score document thourough academic faculty division or update score through AIS based on formative, Middle Exam, and Final Exam.

During the interview, researcher already hold a list of existing operation procedure to confirm about the exiting process that currently running. The interviews result concludes that there is still many new procedure need to be update. Also, the list of procedure that researcher have were actually, most of them are out of date or expired. Founds that several procedure are yet complete or not fulfill researcher answer regarding the valid procedure. Interview add more detail relates with procedure which is not yet defined but solved after done with observations. For instance, KRS request and update
was different. The KRS update were currently done by academic supervisor. While, after done with observation, as mention in interview the process almost same with updating KHS or the latest procedure called as score cleansing. In another hand, we receive several procedure that already updated. Another answer almost the same with interview part II which is done with Mrs. Nuriyah.

Interview Part 2

Regarding with several procedures, is there any latest procedure that need to be updated?

*Most of procedure were actually out of date and the latest one still in discuss with others.*

is there any process which actually yet not stated as procedure but in the practice their available?

*We have some but there so plenty new procedure.*

what kind of service that you probably expect to be available for the institution?

*There is graduation procedure that need to be optimized. I expected that the system may can generated the graduation registrant based on quota. For instance, when the first graduation registration only requires 400 registrant, those who already register may need to join next graduation automatically.*
INTERVIEW RESULT
FINANCE AND ACCOUNTING DIVISION

Dates of interview:

Part I : Tuesday, 06 May 2014 (Head of Finance division, Mrs. Sulamah Susilawati, Mr. Efdison, Ms. Defi Oktafiani)

Interviewed by: Widyastuti Puspita Wijaya

Accounting Division

Regarding with several procedures, is there any latest procedure that need to be updated?

Yes it is. Currently we still optimizing our finance and accounting system, we still working on it in renewal procedure and several division already update their procedure which previously manual, now they already automated system.

is there any process which actully yet not stated as procedure but in the practice their available?

The procedure that you list were actually available. But, it need to update.

The detail of procedure list includes

PMDK Registration

- PMDK registration already terminated and has been changed with PMDK Jalur Undangan. The current process, after receive PMDK registrant, the finance division will receive SK Rector related with tuition set up.
Accountant will recapitulate PMDK registration

And this activities will be coordinate with PUSTIPANDA who accepted and send to pustipanda regarding with tuition set up through bank which is collaborate with UIN.

Bank as third parties will send student information about total payment that has been stored.

Overall, the registration payment process for new student were actually same and based on current procedure. The activities for registration payment for new student basically are same. The registration payment with same procedure includes: PTS-UMB, SNMPTN, SPMB-PTAIN, PMB Mandiri, Jalur Kerjasama, and scholarship

**Tuition payment for odd and even semester**

- Generally the procedure are the same. It starting with SK from rector regarding with payment set up and it will coordinates with pustipanda. The set up then send to the third parties such as bank.

**Double Degree tuition payment**

Currently the procedure were held by faculty. Student who is joint to double degree program were compulsory to paid both tuition fee for two majorities based on term and condition. Double degree program payment by system already done from shar’i faculty.
Nama Prosedur : Penerimaan Mahasiswa Baru Jalur Mandiri
No. Prosedur     : Un.01-B.III-AKDM-SUB.LAY-SOP-001
Sumber Ref.      : SOP Universitas

Appendix III.1 Pendaftaran Jalur Mandiri
Pendaftaran Mahasiswa Double Degree

Nama Prosedur: Mahasiswa Program Gelar Ganda
No. Prosedur: Un.01-B.III-AKDM-SUBLAY-SOP-004
Sumber Ref.: SOP Universitas

<table>
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<tbody>
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<tr>
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<tr>
<td>Kurang</td>
<td>Apakah Lengkap?</td>
</tr>
<tr>
<td>Isi Formulir Pendaftaran</td>
<td>Lengkap</td>
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<tr>
<td>Mengikuti Kuliah &amp; Bayar Biaya per Mata Kuliah</td>
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</tbody>
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Appendix III. 2 Pendaftaran Mahasiswa Double Degree
### Nama Prosedur:
Pelaksanaan dan Pengawasan Ujian SNMPTN

### No. Prosedur
Un.01-B.III-AKDM-SUB.LAY-SOP-011

### Sumber Ref.
SOP Universitas

<table>
<thead>
<tr>
<th>WPUL</th>
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<th>KRI</th>
<th>PG/PM</th>
<th>TU</th>
<th>Peserta</th>
</tr>
</thead>
</table>

1. **Mulai**
   - Terima Materi Ujian

2. **Terima dan Periksa Kelengkapan Seluruh Materi Ujian**
   - Periksa Identitas KR, PG, PM dgn Identitas Panitia Lokal
   - Kenakan Pakaian Sopan dgn Almamater & Tanda Pengenal Pengawas

3. **Terima Naskah Ujian, Lembar Jawaban, BA, Daftar Hadir**

4. **Melakukan Verifikasi Wajah Peserta dgn Tanda Peserta**

5. **Pemeriksaan Alat Komunikasi, Kantung Celana/Baju, & Perhatikan Telinga Peserta**

6. **Duduk Sesuai Nomor**

7. **Periksa & Verifikasi Ulang Kelengkapan Peserta**

8. **Tanda Tangani Kolom Verifikasi pada Daftar Hadir Peserta**

9. **Buka Naskah Ujian di Depan Peserta**

10. **Bagikan Naskah Ujian**

11. **Periksa Kelengkapan Naskah A & Buka Naskah Ujian**

12. **Isi Berita Acara Keadaan Naskah Soal Ujian**

### Appendix III. 3 Pelaksanaan & Pengawasan Ujian SNMPTN (a)
Nama Prosedur : Pelaksanaan dan Pengawasan Ujian SNMPTN  
No. Prosedur     : Un.01-B.III-AKDM-SUB.LAY-SOP-011 
Sumber Ref.      : SOP Universitas

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Appendix III. 4 Pelaksanaan & Pengawasan Ujian SNMPTN (b)

UIN Syarif Hidayatullah Jakarta
Nama Prosedur : Pelaksanaan dan Pengawasan Ujian SNMPTN
No. Prosedur     : Un.01-B.III-AKDM-SUB.LAY-SOP-011 
Sumber Ref.      : SOP Universitas

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<td></td>
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1. Masukkan Amplop AJ.1, Sisa LJU & Berita Acara ke Doos (Box)
2. Isi Berita Acara Serah Terima LJU
3. Tutup & Segel Doos (Box) dgn Segel Khusus
4. Serah Terimakan Seluruh Berkas ke Pelipis Penanggung Jawab Nasib

Appendix III. 5 Pelaksanaan & Pengawasan Ujian SNMPTN (c)
Proses Bisnis Pendaftaran Ulang

Pembuatan KTM

Appendix III. 6 Pembuatan KTM
Pelaksanaan Propesa (saintek&dirasat)

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Appendix III. 7 Pelaksanaan Propesa (Univesitas)

UIN Syarif Hidayatullah Jakarta
Nama Prosedur : Pelaksanaa Propesa  
No. Prosedur : FST-DKNT-KMS-SOP-007 
Sumber Ref. : SOP Fakultas Sains dan Teknologi

<table>
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Appendix III. 8 Pelaksanaan Propesa (fakultas)
Penyerahan Mahasiswa baru dari Universitas ke Fakultas

Nama Prosedur : Penerimaan Mahasiswa Baru dari Universitas
No. Prosedur     : FST-AKM-SOP-004  
Sumber Ref.      : SOP Fakultas Sains dan Teknologi

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Appendix III. 9 Penyerahan Mahasiswa baru dari Universitas ke Fakultas
Proses Bisnis Pengelolaan Kegiatan Pendidikan dan Pengajaran

Pengelolaan Kurikulum

Perancangan Kurikulum (Fakultas)

Appendix III. 10 Perancangan Kurikulum (a)
Nama Prosedur : Perancangan Kurikulum  
No. Prosedur     : FST-AKM-SOP-001  
Sumber Ref.      : SOP Fakultas Sains dan Teknologi

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<th>Pudek Bidang Akademik</th>
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<tbody>
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</tbody>
</table>

- Laporan Workshop & Draft Desain dan Pengembangan {k}urikulum
- Susun & Buat Laporan Hasil Workshop Kurikulum
- Verifikasi Kurikulum Prodi
- Laporan Workshop & Draft Desain & Pengembangan Kurikulum
- Verifikasi {k}urikulum hasil Evaluasi dan Revisi Desain & Pengembangan Kurikulum
- Apakah Diterima?
  - Ya
  - Tidak
- Validasi {k}urikulum hasil Evaluasi dan Revisi Desain & Pengembangan {k}urikulum
- Kurikulum, Form Verifikasi, & Form Validasi
- Selesai

Appendix III. 11 Perancangan Kurikulum (b)
Evaluasi dan revisi Desain dan Pengembangan Kurikulum (Fakultas)

Appendix III. 12 Evaluasi dan revisi Desain dan Pengadaan
Pengelolaan Administrasi Perkuliahan

Pengisian dan Perubahan KRS

Appendix III. 13 Pengisian dan Perubahan KRS
Perbaikan KHS

Appendix III. 14 Perbaikan KHS
KEMENTERIAN AGAMA
UNIVERSITAS ISLAM NEGERI (UIN)
SYARIF HIDAYATULLAH JAKARTA
FAKULTAS SAINS DAN TEKNOLOGI

Jakarta, 05 May 2015

Nomor : Un.01/F9/PP.00.9/2625/2015
Lampiran : -
Perihal : Bimbingan Skripsi

Kepada Yth,
1. Ahmad Nurul Fajar, ST., MT
2. Asep Fajar Firmanasyah Iwa Airlangga, MTI
Dosen Pembimbing Skripsi

Assalamu’alaikum Wr. Wb.

Dengan ini diharapkan kesediaan Saudara untuk menjadi bimbingan 1/II/
(Materi/Teknis)* penulisan skripsi mahasiswa:

Nama : Widyastuti Puspita Wijaya
NIM : 1110093100014
Program Studi : Sistem Informasi (International)
Judul Skripsi : “Analyzsis And Design Using SOA Approach (Case Study:
UIN Syarif Hidayatullah Jakarta)”

Judul tersebut telah disetujui oleh Program Studi bersangkutan pada tanggal 17
September 2014 dengan outline, abstraksi dan daftar pustaka terlampir. Bimbingan skripsi
ini diharapkan selesai dalam waktu 6 (enam) bulan setelah ditandatangainnya surat
penunjukkan pembimbing skripsi.

Apabila terjadi perubahan terkait dengan skripsi tersebut selama proses
pembimbingan, harap segera melaporkan kepada Program Studi bersangkutan.

Demikian atas kesediaan Saudara, kami ucapkan terima kasih.

Wassalamu’alaikum Wr. Wb.

an Dekan
Wadek Bidang Akademik

Prof. Dr. Lily Surayya EP., M.Env.Stud
NIP. 1969040419720512 005

Tembusan:
Dekan (sebagai laporan)
KEMENTERIAN AGAMA
UNIVERSITAS ISLAM NEGERI (UIN)
SYARIF HIDAYATULLAH JAKARTA
FAKULTAS SAINS DAN TEKNOLOGI

Nomor : Un.01/F.9/TL.0,3/2624 /2015
Lampiran : -
Perihal : Permohonan Data/Riset

Kepada Yth.
Kapala Pusat Teknologi Informasi dan
Pangkalan Data (PUSTIPANDA)
Universitas Islam Negeri Syarif Hidayatullah Jakarta
Gedung Fakultas Syariah Dan Hukum Lantai 1 UIN
Syarif Hidayatullah
Jakarta

Asalamualaikum Wr. Wb

Dengan hormat kami sampaikan bahwa :

Nama : Widyastuti Puspita Wijaya
NIM : 1110093100014
Jurusan/Semester : Sistem Informasi (Internasional/X (Sepuluh)
Tahun Akademik : Semester Genap 2014/2015
Program : S-1
Alamat : Jln. WR. Supratman 63 Cempaka Putih Ciputat Timur
Telp. : 081911292993

Adalah benar mahasiswa Fakultas Sains dan Teknologi UIN Syarif Hidayatullah
Jakarta dan bermaksud melakukan penelitian/riset data di instansi yang Bapak/Ibu
pimpin, yang sedang dalam penyelidikan skripsi dengan judul skripsi:

"Analysis And Design Using SOA Approach"

Untuk itu, kami mohon kesediaannya untuk memberikan kesempatan kepada
mahasiswa tersebut dalam melaksanakan penelitian/riset di instansi/perusahaan yang
Bapak/Ibu pimpin.

Demikian, atas perhatian dan kerjasamanya kami ucapkan terima kasih.

Wassalamualaikum Wr. Wb.

a.n.Dekan,
Wadek Bidang Akademik.

Prof. Dr. Lily Suryayna E.P., M.Ag./Stud
NIP. 19690404200501 2 005

Tembusan :
Dekan (sebagai laporan)
KEMENTERIAN AGAMA
UNIVERSITAS ISLAM NEGERI (UIN)
SYARIF HIDAYATULLAH JAKARTA
FAKULTAS SAINS DAN TEKNOLOGI

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Nomor : Un.01/F9/ PP.00.9/2015
Lampiran : -
Perihal : Undangan Seminar Hasil

Jakarta, 30 April 2015

Kepada Yth.
1. Dr. Ahmad Nurul Fajar, M.T.
2. Asep Fajar Firmansyah Iwa, MTI

Assalamualaikum warahmatullah wabarakatuh

Kami mengundang Bapak/Ibu Dosen Pembimbing untuk mengikuti seminar hasil penelitian skripsi mahasiswa Sistem Informasi, yang diselenggarakan:

Hari, tanggal : Selasa, 05 Mei 2015
Pukul : 10.00 – 11.00 WIB
Tempat : Ruang 407 B

Pada seminar ini dipresentasikan hasil penelitian skripsi mahasiswa Sistem Informasi
Nama : Widiyastuti Puspita Wijaya
NIM : 1110093100014
Judul : Analysis and Design Using SOA Approach (Case Study : UIN Syarif Hidayatullah Jakarta)

Demikian undangan ini disampaikan dan kami sangat mengharapkan perhatian dan partisipasi Bapak/Ibu untuk mengikuti acara ini.

Wassalamualaikum warahmatullah wabarakatuh

Dalam Kebersamaan Sistem Informasi
Secretary Jurusan Sistem Informasi

M. Kusnadi,
NIP. 19750412 200710 2 002

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