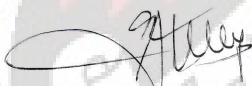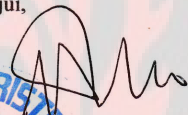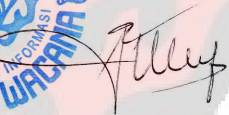# Lembar Pengesahan

Judul Tesis : SOMA Method In Modeling Business Process Automation Of Thesis Proposal Submissions (Case Study: SWCU – Psychology Faculty)

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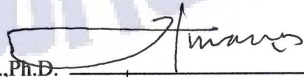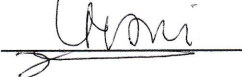Dr. Dharma Putra Palekahelu, MPd   Prof. Dr. Ir. Eko Sediyono, M.Kom.
Dekan   Ketua Program Studi

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SOMA METHOD IN MODELING BUSINESS PROCESS AUTOMATION OF THESIS PROPOSAL SUBMISSIONS (CASE STUDY: SWCU – PSYCHOLOGY FACULTY)

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ABSTRACT

SOA is a framework that integrates business processes and supports IT infrastructure, so it becomes possible to integrate between several Information Systems in an organization, especially in tertiary educational institutions. The goal of this research is to analyze and devise business process automation checking the completeness of proposal submissions using Service Oriented Modeling Architecture (SOMA) in the Psychology Faculty of Satya Wacana Christian University, Salatiga, as well as compare the business processes of checking the completeness of thesis proposal submissions before and after being integrated. From here, the advantages will be found from the services that are implemented in the completion checking system of thesis proposal submissions. When the system has been integrated, it can help in the thesis proposal management process, so that it can facilitate all related parties.

Keywords: *SOA, SOMA, Information systems, Integration*

1. INTRODUCTION

Information technology is used to assist improving the work performance and organization business processes. In optimizing the business processes of an organization, institutions utilize technology through making applications, where the applications are expected to be able to interact with each other and work together to fulfill these needs. Activities and interactions can occur if there are interactions between several systems in an institution, which in its development uses Service Oriented Architecture (SOA) [1]. SOA is usually used to bring changes in a process to handle problems related to data management [2]. Service Oriented Architecture (SOA) is an ideal solution to handle integration problems between systems by relying on a web services concept [3][4]. The superiorities of a web service can be utilized to solve information system integration problems in an organization [4] [5]. System integration is an important need

in business processes that has its own complexities in a company. By integrating various kinds of systems, it is hoped the control process of a certain business process can be done easily [4].

Information Systems is an important factor in an organization like a tertiary educational institution [1]. Information systems in a tertiary educational institution can be divided into several fields based on needs like a Grading Information System, Registration Information System, and others.

Research conducted by Hamdan, et. al (2012). associated with SOA, which in this research explained that using the SOA applications are involved with some emergency systems that can be integrated. Through this research, the concept of a Service Oriented Architecture (SOA) methodology which will be implemented is Service-Oriented Modeling and Architecture (SOMA). SOA can bridge one platform with another one through an information system [2]. A SOMA method will be applied in this research for Modeling Business Process Automation in Checking Completion of Thesis Proposal Submissions in the Psychology Faculty of Satya Wacana Christian University Salatiga. A SOMA Method is a model and design method to model from a business model to an IT model using SOA. This uses a SOMA method because in checking the completion of thesis proposal submission in the SWCU Psychology Faculty, there are 2 related units: the faculty thesis bureau and BARA. Every unit has clear tasks and responsibilities that are different from each other. Therefore, it is necessary to integrate them using a SOMA method. This does not include integration between several other related Information Systems like

the Grading Department and Registration Department with the process of checking the completeness of the thesis proposal submissions. The business process that is related is the Grading Information Systems and Registration Cards, where thesis proposal submissions of the SWCU Psychology Faculty are still done manually, meaning that students who do their TA are required to fulfill several requirements like they must make TA proposals along with Registration Card submissions and Grade Transcripts. As there is no integration, it results in many problems in every section, as there is no coordination between one unit and another one. Based on the problems above, the formulation of the problem in this research is how SOMA Method in Modeling Business Process of Thesis Proposal Submissions.

2. LITERATURE REVIEW

2.1 Service Oriented Architecture (SOA) Concept

Service Oriented Architecture (SOA) is a new model representation to build applications that are distributed [6]. SOA is an architectural way to modularize an information system to become services [7]. SOA is a framework that integrates business processes and supports safe IT infrastructure, standardized components (services) that can be reused, and included in changing business priorities [8]. Several key aspects in the SOA principle are: [9]

- Loose coupling, which is services that reinforce a relationship that minimizes dependence and they only need to maintain awareness between each other.

- Service contract, services are attached to a communications agreement, which is defined

collectively by one or more related service descriptions.

- Abstraction, all services that are described in a services contract, services hide logic from the outside world.
- Reusability, logic is divided to become services with the purpose of being reused.
- Composability, compiling the services that can be coordinated and collected to form different services.
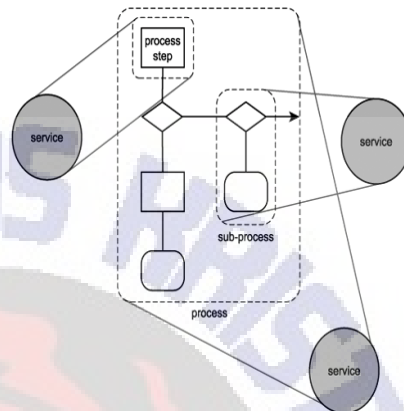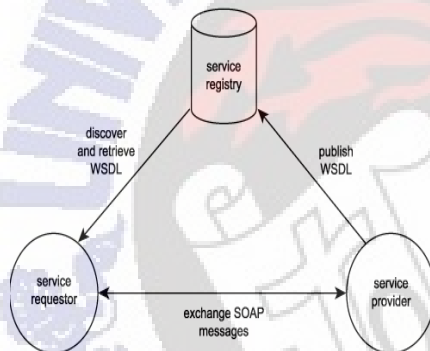

Figure 1: Early SOA Structure [9]

Figure 1 is a figure of SOA architecture when it is first introduced. SOA has 3 primary parts: the service requestor, the service provider, and the service registry. Between the service registry and the service provider they are joined with Web Service Definition Language (WSDL) that becomes an instrument to define the service that is provided. Meanwhile, the connector between the service provider and the service requestor is Simple Object Access Protocol (SOAP), which is a standard to send messages from the two services. In service registry and service requestor, there is Universal Description Discovery and Integration (UUDI), which is a service registry standardization. Several of these

components can be found in a web service [9].

Figure 2: Service Architecture in SOA [9]

According to Erl, services can be divided to become several small parts. However, the scope for every service can be varied like in Figure 2, which shows that every service has different services. There are those which handle a small number of the problems or also called sub-processes. There are also those which handle almost all of the problems faced. This will facilitate adding several services without having to change the architecture used.

SOA can become a middle layer between business logic and application logic [9]. This shows that every service which is added does not influence existing parts, because the service is only inserted between the two parts. This can be seen in Figure 3, which reveals that service is in the middle layer and does not enter another part because it is only a bridge to communicate between parts. Besides that, it can be seen that the service provided can be utilized by various platforms.
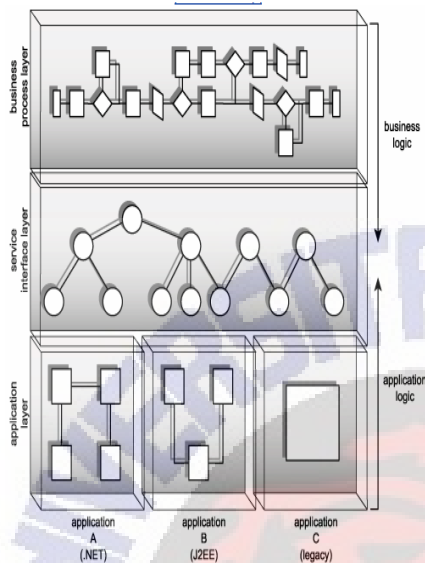
Figure 3: SOA Structure in Business Logic and Application Logic [9]

Figure 3 show a service layer is divided into small parts that will serve certain problems. Therefore, every service has a specific function, but between one service and another service there is still a connection. This is like a principle from SOA which divides services into smaller parts to handle various problems.

The advantages of applying SOA are as follows [10]:
1. Quickness.

   In SOA, business processes are broken down and simplified in the form of smaller services. The dependence between services is minimized. Therefore, whenever there are changes in a certain business process, it is enough for the related service to be changed.
2. Real-time responsive.

   In services there are business rules and limitations in business. Services are saved and managed in an application server called ESB.

This allows various kinds of applications to access the business rules.
3. Efficiency.

   Although in the beginning implementing SOA needs a big cost, by implementing SOA, it makes it easier to develop a central system, so that many resources can be reduced.
4. Channel independent.

   A business is related with many sides, whether customers or suppliers. Various sides that are related in a certain organization make it easier to have various kinds of different applications. By having services and ESB, they facilitate these various applications to access the defined business rules.
5. Development time is shorter.

   In SOA, business processes that are broken down into smaller services make it easier for changes and developments in certain services. Because developments are done in a focused manner, the time needed is less.
6. Reduce duplications.

   Services in an SOA are managed in an application server called ESB. The services are managed centrally, so it will reduce the likelihood for a duplicate system. In addition, the form of service that facilitates reusability can reduce the same functions being present in a system.

2.2 Service-Oriented Modeling and Architecture (SOMA)

Service-Oriented Modeling and Architecture (SOMA) is a model and design method to model from a business model to an IT model using SOA [11].

The SOMA method is one of the architectures offered by IBM that defines 3 stages of service modeling, which are primarily identification, specification, and realization. All of these steps consist of several sub-steps that recommend appropriate techniques which can be seen in Figure 4 [12].
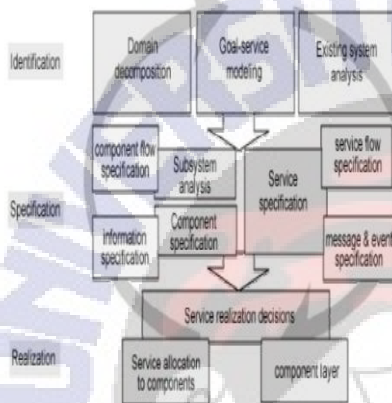

Figure 4: Service Identification, Specification, and Realization with SOMA [12].

The SOMA method in the identification stage can begin from domain decomposition, which included in it are functional area analysis and process decomposition. The goal services modeling technique shows the desired goal from the service, for example can be identified with Key Performance Indicators (KPIs) to define service abstraction and monitor the goal reaching process.

The steps in a SOMA method are done iteratively. In service specification, an SOA process is conducted. Service specification is a service model specification that is a primary key from the SOMA method which handles all services. In the realization stage, it realizes all services and components that have been previously designed. [12].

3. Analysis and Designing Using SOMA Method

- Identification

The first process that is done in the SOMA method stage is identifying the problem that will be researched. Modeling Business Process Automation in Checking Completion of Thesis Proposal Submissions is the problem that will be examined and researched. The problem environment that will be worked on is to fulfill organizational needs, supporting units that are related with the thesis proposal gathering completion checking business process, information system users in integrating the information systems present in the thesis proposal submission completion checking system that will be built. The identification process is depicted with UML using use case diagrams for every unit that is related with the thesis proposal submission completion checking business process.
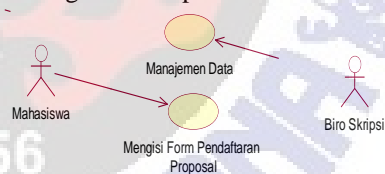

Figure 5: Use Case Diagram of Thesis Proposal Submission

In Figure 5, for the Use Case Diagram of Thesis Proposal Submission, students fill in their thesis proposal submission forms and complete the requirements to continue to the thesis proposal stage. Then it is returned to the Thesis Bureau. The Thesis Bureau is in charge of managing

all student data.

Figure 6: Use Case Diagram of Checking Completion of Registration Cards and Student Transcripts

In Figure 6, the Use Case Diagram Checks Completion of Registration Cards and Student Transcripts. For BARA, students complete the proposal submission conditions and examination registration by checking the completion of registration cards and student grade transcripts.

In the identification stage, results are obtained in the form of the thesis proposal completion checking business process design that occurs in the Psychology Faculty of SWCU after being integrated. This can be seen in Figure 7.
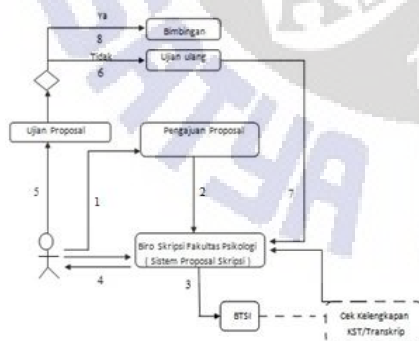

Figure 7: SWCU Psychology Faculty Thesis Proposal Submission Completion Checking Business Process Design (Integrated)

Figure 7 explains about the Thesis Proposal Submission Completion Checking Business Process Design with the system that has already been integrated. The explanation is as follows:

- First, students who do thesis proposal submission can access the thesis system. Related to this, students will log in using a user name and password from the respective student. After the student logs in to the system, the student can fill in the proposal submission form.
- In filling in the thesis proposal submission form, all of the conditions have to be met, in order that the student can submit the form. While filling in the thesis proposal submission form, the student has to check the status from the completion of the registration card / student grade transcript.
- In checking the registration card and grade transcript, the BARA system will automatically send an explanation of the status, Registration OK or NOT OK and Transcript OK or NOT OK, as one of the requirements that are related with the thesis proposal submission business process. To check the completion of every student, it can be seen in stage three.
- After the checking is done, then the data from the unit will be returned to the faculty thesis system, so that it can be found that the thesis proposal submission completion status is already complete.
- Whenever NO OK (registration card / transcript status) is displayed, the students must go to BARA to receive further confirmation

and complete the requirements. If the registration card / transcript are OK, then the students can submit them and wait for the schedule of the thesis proposal examination.

- If students do not pass the proposal examination, they have do revisions or change their research topics and submit them to the thesis system.
- If students pass the thesis proposal examination, they can continue to the next stage, which is the thesis advising with predetermined advisors.

- **Specification**

In this stage, service specifications are found that will be used in every business unit that is related with the proposal submission completion checking business process according to the use case diagram UML, which was made in the identification stage, explaining the path that occurs in every part using UML, which is an activity diagram.
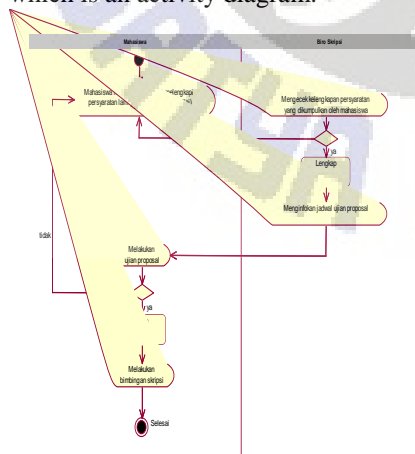
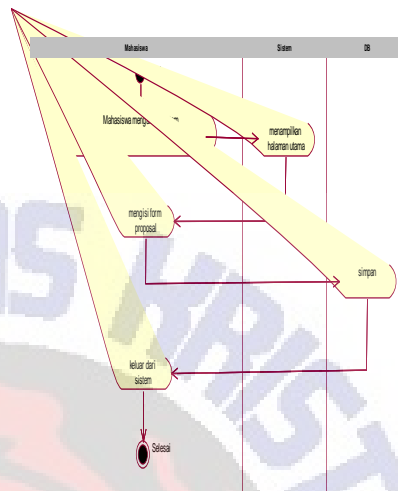*Figure 8: Activity Diagram of Thesis Proposal Submission before Being Integrated*

Figure 9: Activity Diagram of Thesis Proposal Submission after Being Integrated

- **Realization**

In this stage, it starts to choose the solution that will be used, explaining about the details from SOA which will be used in building the system.
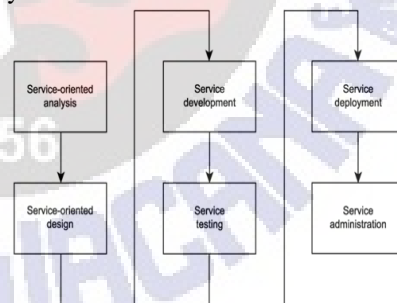
Figure 10: Life Cycle of Service Oriented Architecture (Erl, 2005)

There are 6 stages in the SOA life cycle. However, this research only applies them up to the service-oriented service level.

a. Service Oriented Analysis

This stage is an early stage, where it can determine the potential

scope from SOA, the service field that is mapped, and the individual services modeled as service candidates that include things related with SOA. A modeling service process which is in the form of steps or a step-by-step service modeling process is provided as a part that will be defined in the service-oriented analytical phase. The service candidates found can be seen in Table 1.

Table 1: Business Process Mapping to Service Candidates

No.	Business Process	Service Candidate
1.	Thesis Proposal Submission	*Service* BagianBARA *Service* BiroSkripsiFakultas
2.	Checking completion from the proposal system on BARA	***a. List Task Services*** - Service *Get*HasilStudi - Service *Get*DataMahasiswa - Service *Get*DataMatakuliah ***b.List Entity Services*** - *Service Get*Angka - *Service Get*Kode -Service *Get*Nilai - Service *Get*Nim - Service *Get*Status -Service *Get*Tahun_ambil - *Service Set*Angka - *Service Set*Kode - Service *Set*Nilai -Service *Set*Nim - Service *Set*Status - Service *Set*Tahun_ambil -Service *Get*Alamat -Service *Get*HP -Service*Get*Nama -Service *Get*Nim -Service *Get*TempatLahir -Service *Get*TglLahir - Service *Set*Alamat -Service *Set*HP -Service *Set*Nama -Service *Set*Nim -Service *Set*TempatLahir -Service *Set*TglLahir - Service *Get*Kode - Service *Get*Matakuliah - Service *Get*SksAmbil - Service *Get*SksBayar - Service *Set*Kode - Service *Set*Matakuliah - Service *Set*SksAmbil - Service *Set*SksBayar

b. Service Oriented Design

After making candidates from the service of the analysis stage, the next stage is to make a concrete design from the service candidates present and implement them in a composition that forms a business process.
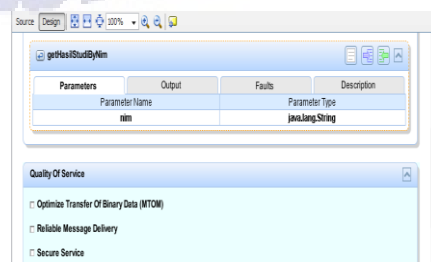

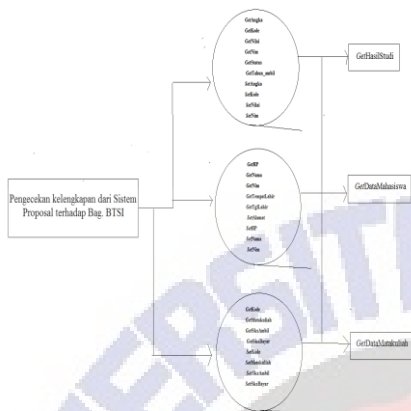*Figure 11: Parameter with Element Name NIM*

Figure 12: Service of Completion Checking Business Process from the Thesis Proposal System on BARA

4. Testing Web Service Integration Service

One of the ways used to implement the SOMA method is through a web service. A web service is an appropriate technology to provide data and process integrated solutions. Therefore, a web service is used to implement this design.
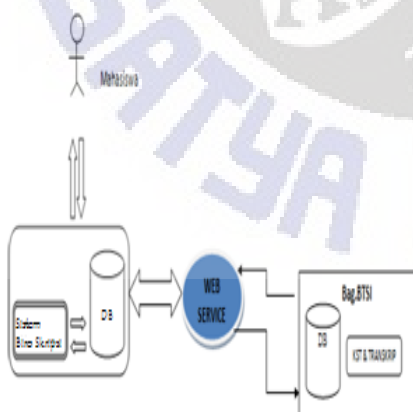

Figure 13: Architectural Design

Figure 13 depicts an architectural design from two integrated systems. There are 2 related units in the

thesis proposal submission completion checking business process that will be integrated. The Grade Transcript already has an application to check student grades that have been integrated with their registration cards (KST) to check student obligations in their studies. The Thesis Bureau does not yet have an application to assist the work process. The thesis proposal submission application that will be built will be used for data analysis. All units will be connected using a web service for data exchange, so that it will facilitate all related parties in the thesis proposal submission completion checking business process.

Web Service implementation at BARA can be seen in Figure 14, 15, and 16. Experiments are done by connecting certain services. With this, the WSDL file with clear structural function services can be seen in Figure 14. In this service, the parameters that are used are NIM (Figure 15), (Figure 16) SOAP responses that contain the results of service requests that are given correct if fulfilled / true and not correct if not fulfilled / false.
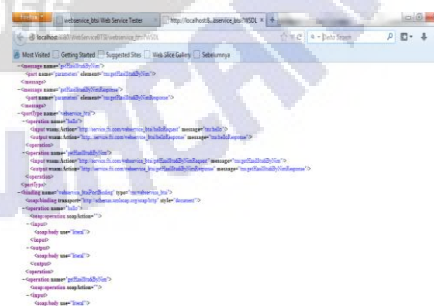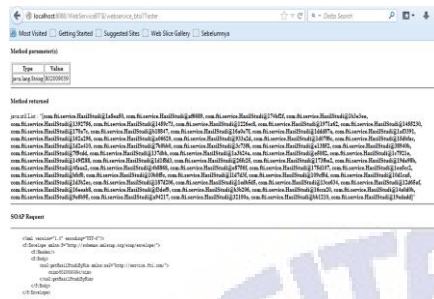

Figure 14: WSDL File of BARA
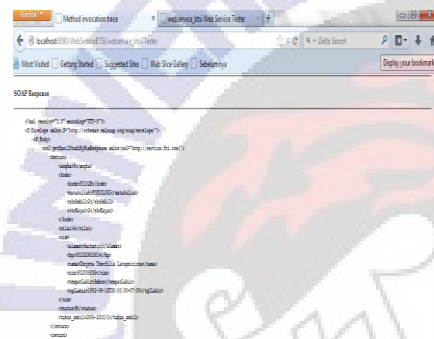
Figure 15: SOAP Request

Figure 16: SOAP Response

Proposal Gathering Information System receives student data that has already been checked by using the web service that is already provided by the related unit with the thesis proposal submission completion checking business process.

Based on the research results, a system design is obtained compared with the old system. In Table 2, the proposal submission system design uses SOMA in a more flexible way compared with the previous system. This makes it possible to make announcements and check the completion of thesis proposal submission automatically.

Table 2: Thesis Proposal Submission Completion Checking Business Process Before and After Being Integrated (Students)

No.	Before Integration	After Integration
1.	Students do their thesis proposal writing (by following the predetermined format).	Students do their thesis proposal writing (by following the predetermined format).
2.	Students complete the requirements for the thesis proposal submission (print out registration forms and transcripts) for BARA.	Students log in to the system, and the proposal system will do an automatic check. If the registration card status and transcript status are OK, then the students can submit their proposals.
3.	Students submit their proposals as well as other requirements to the Thesis Bureau.	
4.	Students do their proposal examinations.	Students do their proposal examinations.
5.	Students who have passed their proposal examinations will advance to thesis guidance. However, students who do not pass their thesis examinations will have to submit new proposals or revise their rejected ones.	Students log in to the system and the proposal system will automatically check. If the registration card status and transcript status are OK, then the students can submit their proposals.
6.	Students who are considered to not pass the proposal examination have to resubmit their proposals as well as other requirements to the Thesis Bureau (return to the beginning stage).	

5. CONCLUSION

The SOMA method makes it easier for the system integration process. What needs to be considered in the system integration to the SOA environment is not the implementation but rather the service specification of the system that will be integrated. A clear service specification will make it easier to arrange. The results in comparing the thesis proposal submission completion checking business process of the SWCU Psychology Faculty before integration need a great deal of time to analyze, because many processes need to be undertaken. In contrast, the thesis proposal submission completion checking business process after being integrated is much quicker and easier whenever seen from the user side, meaning students. In this research, its applying only 2 stages of 6 stages in the cycle of SOA, the service-oriented analysis and service-oriented design. Expected in future research, there are all stages in the cycle of SOA is used.

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