Business architecture and information system architecture design in savings and payment unit Koperasi Pegawai Republik Indonesia (KPRI) Diponegoro University using TOGAF 9 framework

B Noranita, D M K Nugraheni, M I Fitriyani, Y Nurhayati

Department of Computer Science/Informatics, Faculty of Science and Mathematics, Diponegoro University, Jl. Prof.H.Soedarto S.H, Tembalang, Semarang 50275, Indonesia

Corresponding author: dinar.mutiara@live.undip.ac.id, yulinurhayati7@gmail.com

Abstract. Savings dan Payment unit is one of the units of the Koperasi Pegawai Republik Indonesia Diponegoro University (KPRI). In the development of these units already have information systems infrastructure, namely the Cooperative Information Systems (SIMASPRI) and KPRI website. However, data processing on the system has not been integrated also not all business processes can be handled through the information system. SIMASPRI does not have features that allow members to carry out registration processes, loan applications, deposit payments, and installments online. So, members must come to the cooperative every time they want to carry out a registration or transaction process. Meanwhile, KPRI has a target for members to be able to process registration, deposit payments, apply for loans, and pay installments online using a website or mobile application. So it is necessary to improve the features and functions of the Cooperative Information Systems and KPRI website, as well as the design in the mobile version with the aim to offer convenience to members in accessing. Therefore, an analysis of business architecture and information system architecture design as a basic framework of business solutions to solve problems in optimizing the use of information technology. This study uses the TOGAF (The Open Group Architecture Framework) framework with the stages passed, namely preliminary, vision architecture, requirements management, business architecture and information system architecture consisting of data architecture and application architecture. From the analysis of the architectural design and approval of KPRI Diponegoro University manager, the proposed blueprint business architecture, data architecture and application architecture as the basic foundation needed to support business activities in the Saving dan Payment unit KPRI Diponegoro University.

1. Preliminary
Koperasi Pegawai Republik Indonesia (KPRI) is a business entity that implements IT in its business operations. The savings and financing unit is one of the units in KPRI that focuses on basic savings services, mandatory savings, voluntary savings, and provides loan facilities only to cooperative members. The savings and financing unit has been running an information system to manage savings and financing activities to be more effective and efficient, namely the existence of the Cooperative Information System (SIMASPRI) and the KPRI website.
SIMASPRI and the KPRI website are IT services that are used to support the smooth process of saving and financing carried out by members. SIMASPRI supports the function of recording and processing data on deposits, loans and loan installments, while the KPRI website functions to provide service information to members, in terms of providing access to the provision of forms required for registering or submitting loans. However, data processing in the system has not been integrated and not all business processes can be handled through the information system. In addition, the availability of the KPRI web that is used by members and prospective members is not enough to provide benefits. Members cannot access transaction data such as deposits, loans and installments, and cannot conduct transactions online. Meanwhile, prospective members cannot register through the KPRI website.

Therefore, the need for data integration, development of information systems, the addition of features and functions on the web that are tailored to the needs, as well as the need for mobile-based development. Mobile-based development is intended for members, so members can access the application with a user-friendly display and can access it wherever and whenever. Thus, providing convenience and speed of access to information needed.

Therefore, it is necessary to analyze the design of business architecture and information system architecture that is used as a reference in building information systems in KPRI savings and financing units. Analysis of the design carried out using an enterprise architecture framework, namely TOGAF ADM. TOGAF is an architecture framework that provides methods and tools to build, manage, and implement and maintain enterprise architecture [1].

2. Literature Review

2.1. Framework Selection
The design analysis is done using an enterprise architecture framework. There are various frameworks that can be used in designing enterprise architecture including The Open Group Architecture Framework (TOGAF), Zachman Framework, and Federal Enterprise Architecture Framework (FEAF). If the three frameworks are compared, TOGAF is superior because it has a methodology and standards in implementing enterprise architecture and has a set of detailed architectural principles and depictions. Therefore, the framework that will be used in this study is TOGAF. TOGAF is an architecture framework that provides tools and methods for building, managing, and implementing enterprise architecture [1].

2.2. Enterprise Architecture
Enterprise architecture (EA) is a specific description of the current state of enterprise analysis which is then innovated by considering the results of the previous analysis in accordance with the desires in the fields of operations, management processes, and information technology [2]. According to The Open Group, enterprise architecture is a blueprint which is the result of the analysis of output by taking into account the achievement of the organization's mission to determine business, information, and technology [1].

2.3. TOGAF
TOGAF is one of the enterprise architecture frameworks used in designing organizational architecture. This framework provides methods and tools to assist in the acceptance, production, use, and maintenance of an architecture of the system that runs to support business activities. In general, four types of architecture in enterprise architecture, namely business architecture, data, applications, and technology [1]. The phases in the TOGAF ADM include the following [1], or as shown in Figure 1:

2.3.1. Preliminary Phase. This phase has the objective in preparing research into enterprise architecture design to match what is expected.
2.3.2. Phase A: Architecture Vision. This Phase aims to create a common view of the importance of designing enterprise architecture to achieve the goals of the organization and determine the scope of strategic planning used.

2.3.3. Phase B: Business Architecture. This phase is the phase that contains the business strategy, organization, and information on the main activities. Business architecture is often needed as a means to show the value of the activity and the proposed activity flow according to the needs of stakeholders. The business architecture phase is the phase that contains the main business, organizational, and activity information strategies. Business architecture is often needed as a means to show the value of the activity and the proposed activity flow according to the needs of stakeholders.

2.3.4. Phase C: Information System Architecture. This phase defines the information system architecture which consists of a combination of data architecture and application architecture.

2.3.5. Phase D: Technology Architecture. This phase is the phase to map application components defined in the application architecture into a set of technology components that represent software, hardware, and network components.

2.3.6. Phase E: Opportunities and Solutions. This phase is focused on organizational activities and technical perspectives to rationalize IT activities and logically classify IT activities into project work packages in the portfolio and also in any other portfolio that depends on IT.

2.3.7. Phase F: Migration Planning. This phase is the creation of an appropriate implementation and migration plan, in collaboration with the portfolio and key managers.

![Figure 1. TOGAF ADM](image)

2.3.8. Phase G: Implementation Governance. This phase is used as a reference for project implementation as a work plan program and processed in order to achieve the desired architecture.

2.3.9. Phase H: Architecture Change Management. This phase is used to describe the drivers of change and how to manage these changes, from simple maintenance to architectural redesign.
2.3.10. Requirement Management. This phase is a process for managing the architectural design requirements that are used in all TOGAF phases. The purpose of this phase is to determine the needs of enterprise architecture that are stored and then entered in each phase accordingly.

3. Research Methods
This research was conducted through several stages, namely the initial stage, the stage of analysis and design, and the final stage. The initial phase consists of problem identification, preliminary, and data collection through interviews, observations, and document studies. The analysis and design phase consists of defining the preliminary phase, architecture vision phase, and designing the business architecture and information system architecture. Meanwhile, the final phase consists of testing the design, and making conclusions. The stages of the research methodology carried out can be seen in Figure 2.

3.1. Preliminary
In this phase the definition of planning principles is carried out as a reference in developing data and application architectures and the objectives of each predetermined principle. In addition, also define the scope of KPRI by defining it using 5W (what, who, where, when, and why) + 1H (how) in architectural design.

3.2. Architecture Vision
This stage consists of defining the Diponegoro University KPRI profile, the organization's vision and mission, the organizational structure and business strategy that will be carried out. In addition, it is also necessary to describe the organization's business processes through business activities, which consist of the main activities and supporting activities, define stakeholders, and determine the relationship between activities and stakeholders. The resulting output is a matrix and diagram. The matrix is a stakeholder map matrix and the resulting diagram is a value chain diagram.

3.3. Requirement Management
At this stage an analysis of the current condition of business activities and problems faced by the Saving and Payment Unit will be carried out. So, it will be explained about the transaction processing flow which consists of the process of member registration, deposit payment, loan application, and installment payments and identification of problems faced by the KPRI Diponegoro University savings and financing unit.

3.4. Business Architecture
In this phase a description of the current business architecture is carried out and maps it in detail. Then, based on the mapping, a business model that will be determined in accordance with the goals of KPRI Diponegoro University Saving and Payment Unit. The resulting output is in the form of catalogs and diagrams. The catalogs produced include organization / actor catalogs, drivers / goals / objective catalogs, role catalogs, business services / function catalogs, and process / event / control catalogs. Meanwhile, the diagrams that will be produced are usecase diagrams, activity diagrams, and sequences diagrams.

3.5. Architectural Design
In this phase a description of the current business architecture is carried out and maps it in detail. Then, based on the mapping, a business model that will be determined in accordance with the goals of KPRI Diponegoro University Saving and Payment Unit. The resulting output is in the form of catalogs and diagrams. The catalogs produced include organization / actor catalogs, drivers / goals / objective catalogs, role catalogs, business services / function catalogs, and process / event / control catalogs. Meanwhile, the diagrams that will be produced are usecase diagrams, activity diagrams, and sequences diagrams.
3.6. Business Architecture.
In this phase a description of the current business architecture is carried out and maps it in detail. Then, based on the mapping, a business model that will be determined in accordance with the objectives of the cooperative Saving and Payment Unit The resulting output is in the form of catalogs and diagrams. The catalogs produced include organization / actor catalogs, drivers / goals / objective catalogs, role catalogs, business services / function catalogs, and process / event / control catalogs. Meanwhile, the diagrams that will be produced are usecase diagrams, activity diagrams, and sequences diagrams.

3.7. Data Architecture.
This stage is carried out by identifying all data components used in the flow of business activity processes and identifying the target data needed by the application. Identification is done that is determining the data structure used in each desired application, and making modeling the expected data architecture.

3.8. Application Architecture.
This application architecture defines the applications currently used for storing transaction and financing, as well as identifying applications needed to process data and support business activities. The application that has been defined will explain the involvement of actors and functions that can be accessed in each application. In addition, it will explain the utilization of data design at each interface of the application.

![Diagram](image)

Figure 2. Research methods

4. Result and Discussion
The use of sections to divide the text of the paper is optional and left as a decision for the author. Where the author wishes to divide the paper into sections the formatting shown in table 2 should be used.
4.1. Preliminary

This principle is needed as a reference in designing the EA which is done in comparison of data and applications in the Diponegoro University KPRI Saving and Payment Unit. Next determine the purpose of each principle. The table catalog is used to provide an understanding of the principles that will be used in the design, which can be seen in Table 1.

| Architecture | Principle | Objective |
|--------------|-----------|-----------|
| Business     | The architecture created must be in accordance with the activities, objectives, and processes of member registration, deposit payments, loan applications, installment payments, and monitoring reports on the KPRI Diponegoro University Saving and Payment Unit. | Supports the process of member registration, deposit payments, loan applications, installment payments, and monitoring reports that occur in the KPRI Diponegoro University Saving and Payment Unit. |
|              | The architecture created must comply with applicable regulations and laws | Improve services to KPRI Diponegoro University members |
| Data         | Data storage and management must be good because it is an important asset of KPRI Diponegoro University. | Stored data can support business activities of KPRI Diponegoro University. |
|              | The data designed must be protected from access by unauthorized parties. | To protect the security and confidentiality of data from unauthorized parties. |
|              | - To protect data manipulation. | - Manage stakeholder access rights in managing data. |
|              | Integrated and accessible data. | Facilitate the data management process to improve service quality. |
|              | Stored data must be accurate, in accordance with facts and no data duplication. | Data must be accessible to stakeholders in accordance with their access rights. |
|              | - Streamlining business activities. | Avoiding inaccuracies in the results of each transaction. |
| Application  | The results of the application design must be in accordance with the objectives, activities and business processes that occur in the Diponegoro University KPRI savings and financing unit. | Improve savings and financing services to cooperative members. |
|              | Designing applications that are easy to use (user friendly). | Supports business processes on KPRI Diponegoro University. |
|              | Applications can be accessed as needed. | Increase the effectiveness of business processes, ease of implementation and improve resource efficiency. |
|              | Every stakeholder has access rights to access the pages or features available, | |
Identification of 5W + 1H (what, who where, when, why, and how) aims to identify the objects involved in making enterprise architecture designs. Each object provides an understanding of the description of the enterprise architecture design to be created. The results of the identification process can be seen in Table 2.

**Table 2. Identification of 5W+1H**

| No. | Driver | Description |
|-----|--------|-------------|
| 1.  | *What* | Object: Architectural scope  
Description: create a business architecture model design and information system architecture that consists of data architecture and applications. |
| 2.  | *Who*  | Object: Architectural scope  
Description: create a business architecture design model and information system architecture that consists of data architecture and applications.  
Object: Actor involved in modeling enterprise architecture.  
Description:  
a. Designers: Mirda Indah Fitriyani and Yuli Nurhayati  
b. Person in charge: KPRI Diponegoro University Manager, Drs. Setyo Wardoyo |
| 3.  | *Where* | Object: Location of research object  
Description: Saving and Payment Unit for the Employee Cooperative of the Republic of Indonesia Diponegoro University, located at Jl. Prof. Soedarto, SH Tembalang Semarang. |
| 4.  | *When* | Object: Time of research  
Description: October 2019 - February 2020. |
| 5.  | *Why*  | Object: The reason for the analysis of the design of enterprise architecture data and applications created  
Description: To find out data and applications that have been implemented, as well as to design an information system architecture in accordance with the desired target to support the effectiveness of business activities in the Diponegoro University KPRI Savings and Financing Unit. |
| 6.  | *How*  | Object: Implementation of enterprise architecture design  
Description: The design of enterprise architecture is created using the TOGAF 9 framework. |

4.2. **Architecture Vision**

KPRI Diponegoro University is a business entity located on the Diponegoro University Tembalang campus. This business entity has two business units, namely a shopping business, as well as a savings and financing business. On the unit. The Diponegoro University KPRI Savings and Financing Unit focuses on providing basic savings, compulsory savings, voluntary savings and providing loan facilities only to members.

The business scope identified in this unit includes providing savings and financing services from and only for KPRI Diponegoro University members. Within this scope, there are several activities that become business activities which are divided into several fields, including the main activities and supporting activities that are defined using the value chain, which can be seen in Figure 3.
The process of member registration, deposit payments, loan applications, installment payments, and monitoring reports on the KPRI Diponegoro University Saving and Payment Unit is managed by several stakeholders. Stakeholders are Diponegoro University KPRI employees who have an interest in the activities that run at Diponegoro University KPRI. After knowing the tasks and functions in table 3, it can be determined what is the main focus of each stakeholder to be a Map Matrix Stakeholder. Classification of the class of stakeholders and their authority based on their involvement and influence.

**Table 3. Stakeholder Map Matrix**

| Stakeholder                  | Key Concern                                                                 | Class          |
|------------------------------|-----------------------------------------------------------------------------|----------------|
| Chairperson                  | - Success of planned business targets.                                      | Keep Satisfied|
|                              | - Alignment between objectives, business processes and technology in the savings and financing unit. |                |
| Deputy Chair I               | - Number of borrower in KPRI Diponegoro University Saving and Payment unit. | Keep Satisfied|
|                              | - The success of existing policies in the saving and financial unit.        |                |
| Treasurer                    | - The flow of money in and out.                                             | Keep Informed  |
| Cooperative Manager          | - The success of the Saving and Payment unit work program.                 | Keep Satisfied|
|                              | - Increase in the number of KPRI Diponegoro University members.            |                |
|                              | - Number of borrowers in KPRI Diponegoro University Saving and Payment unit. |                |
| Savings dan Payment unit     | - The success of the Saving and Payment unit work program.                 | Key Players    |
| Finance Division             | - Reports on deposits, installments and loans.                              | Minimal effort |
| General Division             | - Successful registration of new members of KPRI Diponegoro University.    | Minimal effort |

*Keep Satisfied.* The stakeholders must be satisfied. This Stakeholder is interested in high-level driver, goals, funding, and aligning change activity. An understanding of project content and how the goals are translated into effective process.

*Key Players.* Stakeholders who are the main actors in carrying out activities. An understanding how to ensure that access of information and data only those who have permission and ensuring the consistent governance of the organization’s business, data, application and technology assets.

*Minimal Effort.* Stakeholders who have low influence and low involvement in activities. The stakeholder in this classification should keep be informed as necessary but not investing too much effort.

*Keep Informed.* The stakeholders must be satisfied. Stakeholders who must always be given information. Stakeholder in this classification required to support the architecture and changes to it like operationally achieving on-time, on-budget delivery of change initiative with agreed scope.
4.3. Architecture Vision Requirement Management

One of the results of the analysis of this stage is the identification of organizational issues. Organizational issues are the identification of problems that exist or are faced in the process in the Diponegoro University KPRI Saving and Payment Unit. The main problem of the system at Diponegoro University KPRI is that the system has not been integrated in the management of business activities. This has led to repeated activities in data input to the system. In addition, some of the main problems faced in this unit can be seen in Table 4.

**Table 4. Organization Issue Unit for Saving and Financing of KPRI Diponegoro University**

| Activity       | Issue                                                                 |
|----------------|----------------------------------------------------------------------|
| Member Registration | Diponegoro University KPRI member registration cannot be done online. |
| Loan           | There is no online loan application facility yet.                    |
| Save           | Lack of online deposit payment facilities, checking the history of deposit payments by members online. |
| Installment    | There is no online installment payment facility, checking deposit history by members online. |

4.4. Business Architecture

In this study, after interviews with staff of savings and financing units and observations, then defined current business conditions using activity diagrams. Current Deposit Payment shown in Figure 4, Submitting Loans shown in Figure 5, and Installment Payment shown in Figure 6.

The business architecture target is obtained by interviewing the Diponegoro University KPRI Manager. The expected target is business processes carried out online. Based on an analysis of current conditions and targets, a gap analysis of business architecture design can be seen, which can be seen in Table 5.

The target desired by KPRI Diponegoro University Save and Funding Unit stakeholders is to use a mobile application for members so members can deposit deposits, apply for loans, and pay installments online and easily. In addition, members can also view a history of deposits, loans, and installment payments made.
Table 5. Gap Analysis of Business Architecture Design

| Baseline | Target | Gap |
|----------|--------|-----|
| Prospective members cannot register online | Prospective members can register online | A business process is required to register online |
| Members cannot apply for loans online | Members can apply for loans online | A business process is required to apply for a loan online |
| Members have not been able to see the history of deposit and installment payments | Members can view the history of deposit and installment payments | Business processes are required to view deposit and installment payment history |
| Members cannot make online deposit payments yet | Members can make deposit payments online | A business process is required to make a deposit payment online |
| Members have not been able to make installment payments online | Members can make installment payments online | A business process is required to make installment payments online |
| Viewing reports cannot be done automatically | Viewing reports can be done automatically | Business processes are required to view reports automatically |
| The general division cannot manage members. | The general division can manage members. | A member management process is needed that can be carried out by the general division. |

4.5. Organization/Actor Catalog. Organization / actor catalog is the definition of stakeholders who play a role in the KPRI Diponegoro University Saving and Payment Unit, the stakeholders involved can be seen in table 6.

Table 6. Organization /Actor catalog

| Organization/Actor Catalog | Organization/Actor Catalog |
|----------------------------|-----------------------------|
| Organization               | Actor                       |
| Diponegoro University KPRI Saving and Payment Unit | Chairperson |
|                            | Deputy Chair I              |
|                            | Treasurer                   |
|                            | Cooperative Manager         |
|                            | Saving and Payment Unit     |
|                            | (Credit Manager)            |
|                            | Finance Division            |
Figure 4. Baseline of Deposit Payment Activity Diagram

Figure 5. Baseline Submitting Loans Activity Diagram
Driver/ Goal/ Objective Catalog. The Driver / Goal / Objective Catalog explains the organizational mapping of the savings and financing units with their triggers. Member satisfaction and internal satisfaction of the organization are the drivers of efforts to improve services. The goal to be achieved so that services are better is to develop services that can be accessed online and integrated. These services are savings, loan and installment services for members and data management services for savings, loans and installments. The Driver / Goal / Objective Catalog table can be seen in table 7.

Table 7. Driver/ Goal/ Objective Catalog

| Organization                        | Driver                  | Goal                                      | Objective                                                |
|-------------------------------------|-------------------------|-------------------------------------------|----------------------------------------------------------|
| Diponegoro University               | Member satisfaction     | Services that can be accessed online and integrated | Savings, loan and installment services for members      |
| KPRI Saving and Payment Unit        | Internal organizational satisfaction |                              | Savings, loan and installment data management services |

Role Catalog. Role catalog is an activity role for each stakeholder in the business process in KPRI Diponegoro University Saving and Payment Unit. The purpose of making a role catalog is to make it easier to describe activities at the design stage of business architecture. Role catalog can be seen in table 8.

Table 8. Role catalog

| Actor                        | Role                                               |
|------------------------------|----------------------------------------------------|
| Chairperson                  | Provide legality in applying for member loans      |
| Deputy Chair I               | Provide legality in applying for member loans      |
| Treasurer                    | Provide legality in applying for member loans      |
| Cooperative Manager          | Supervise the process of saving, borrowing, and installments through reports |
Saving and Payment Unit  | Carrying out the process of administration of deposits, loan applications, and installments by members  
| Manage data on members’ deposits, loans and installments  
Finance Division  | Make financial reports based on data from the Saving and Payment Unit  
General Division  | Verifying the registration of new members  
| Manage member data  

Business Service/ Function Catalog. Mapping business functions with business services can be done using Business Service / Function Catalog. Business services in the Saving and Payment Unit such as member services, member administration services, and internal services of the Saving and Payment Unit. Each service has its own business functions according to the users of the service. The catalog can be seen in table 9.

| Business Function | Business Services |
|------------------|-------------------|
| Applying for a loan | Member Services |
| Make installment payments | |
| Payment of deposits | Member Administration Services |
| Member Registration | |
| Manage member data | |
| Manage loan data | Saving and Payment Unit Services |
| Manage installment data | |
| Manage data storage | |
| Manage bills | |

Process/ Event/ Control/ Product Catalog. Table 10 explains that making architecture is used to map activities and inputs to issue a product that is in the company. The member registration process, applying for loans, deposit payments, and installment payments have input that starts why the process is carried out. Furthermore, before each process is completed there is a precondition process such as seeing the identity of the members. If the process is complete, a product will be produced for each process.

| Process/ Event/ Control/ Product | Process | Event (Input) | Control (Precondition) | Product |
|----------------------------------|---------|---------------|------------------------|---------|
| Member Registration              | Request for new member registration | See the identity of prospective members and employment history | Membership card, bank book |
| Applying for a loan              | A loan request | Verifying member data | Loan |
| Payment of deposits              | Deposit deposit activity | Verifying deposits | Proof of deposit |
| Installment payment              | Installment payment activities | Verify installments | Proof of payment installments |

Activity diagrams are used to illustrate the flow of activities that exist in business processes. Activities that will be illustrated with activity diagrams are deposit payments, loan applications, and installment payments.
Figure 7. Target Payment Deposit Activity Diagram

Figure 8. Target Applying For Loan Activity Diagram
Sequences diagram is a modeling that is used to describe the interaction between objects in usecase by describing the life time of objects and messages sent and received.
In this study, researchers were not given access rights to view databases used in managing data on a running system. Therefore, based on the results of the analysis using the available document forms, an entity analysis consisting of nine entities is obtained, which can be seen in Table 11.

**Table 11. Data Entity Catalog**

| Data Entity     | Attribute                                                                 |
|-----------------|---------------------------------------------------------------------------|
| Member          | member_id, name, nik, nip, address, telephone, faculties *, status, nip, work_units, birth_places, birth_date, date_input, move_year, old_part, rank, rank, class, blood_group, type_member] |
| Faculty Master  | [faculty_code, faculty_name]                                              |
| Loan            | [loan_id, member_id *, loanm_id*, loan_date, kkfj, proof, salary, first_installment, loan, installment, interest, rounding_principal, description] |
| Loan Master     | [loanm_id, loan_type]                                                    |
| Installments    | [installment_id, member_id*, loanm_id* amount, due_date, month, gs, initial_balance, principal, interest, number_pieces] |
| Deposits        | [deposit_id, member_id*, depositm_id*, deposit_type, date]               |
| Deposits Master | [depositm_id, deposit_type]                                              |
| Bill            | [billing_id, member_id*, member_name, faculty, type_installment, loan_date, principal, interest, long_installment, order_installment, balance] |
| Admin           | [username, position, level, period]                                      |

The data architecture target was obtained by interviewing the Diponegoro University KPRI Manager. The expected target is data integration, and data adjustment with the desired application target. Based on an analysis of current conditions and targets, an analysis of the architectural design gap can be obtained, which can be seen in Table 12.
Table 12. Gap Analysis of Data Architecture Design

| Current Conditions | Target | Gap |
|--------------------|--------|-----|
| Data has not been integrated between applications because data management is local using FoxPro. | Integrated data and adjustments to the desired application target. | The need for integrated data design and support the target of the application. |

The design of data architecture uses data dissemination diagrams and class diagrams. Data dissemination diagrams are used to see the relationship between data and business activities and applications that will be designed. The design of the data dissemination diagram can be seen in Figure 14. While the class diagram is used to provide an overview of the conceptual model of data in the form of entities, attributes, methods, and relationships. In addition, class diagrams are also used to show relationships between classes in the system. This relation aims to define the needs of entities in each class that will later be used in the application architecture. The results of class diagram design can be seen in Figure 15, and identification of the entity designed can be seen in Table 13.

Table 13. Class Diagram Identification

| No | Entity      | Description                                           |
|----|-------------|-------------------------------------------------------|
| 1  | deposits    | Store member savings data.                            |
| 2  | loan        | Store member loan data.                               |
| 3  | installments| Store member installment data.                        |
| 4  | member      | Store data of cooperative members.                    |
| 5  | user        | Store cooperative member account data.                |
| 6  | evidence of transfer | Store the payment transfer receipt file. |
| 7  | file register | Store a member registration file.                    |
| 8  | type of loan | Store types of loans on KPRI Diponegoro University.   |
| 9  | type of deposit | Store types of deposits in KPRI Diponegoro University. |
| 10 | faculty     | Store the names of the faculties.                     |
| 11 | province    | Store the name of the province in Indonesia.           |
| 12 | city        | Store city names throughout the province.             |
| 13 | sub-district | Store sub-district names throughout the sub-districts. |
| 14 | interest    | Store data of percent interest used.                  |
4.7. Application Architecture

At present the Cooperative Saving and Payment Unit has several applications to support the business process. Applications available are the Cooperative Information System (SIMASPRI) and the KPRI Diponegoro University web. SIMASPRI is used by credit managers to manage data on savings and loan transactions paid by members. While the cooperative web is used by members or the general public to find out information about cooperatives.

### Table 14. Application Architecture Target

| Activity   | Target                                                        |
|------------|----------------------------------------------------------------|
| Member Registration | Prospective members can register online. Credit managers can confirm from prospective members who have registered, for validation. |
| Loan       | Members can apply for loans online, either through the website or mobile. Credit managers can confirm approval or rejection of loan applications through the system. |
| Deposits   | Members can pay bills online, either through the website or mobile. Credit manager can confirm payment of bill payments that have been paid by members. There is a monitoring system for daily transactions from deposits. There is a system to view the history of deposit payments by members. |
| Installment| Members can make installment bill payments online, either through the website or mobile. The credit manager can confirm the installment payment that the member has paid. The existence of a monitoring system of daily transactions from installments. There is a system to view the history of installment payments by members. |
| Others     | Managers can receive reports on the results of all the main activities of the savings and financing unit. Improved cooperative information systems (SIMASPRI) that can be accessed via the web. |
Based on the results of interviews with the cooperative manager and the problems faced in the Saving and Payment Unit, the expected application targets are obtained. The expected target is to make a web-based application design for management and members as well as the design of mobile applications for members. Targets will be used in the gap analysis stage to determine the design of the application to be made. Targets for the application architecture can be seen in Table 14.

Based on the results of the analysis, applications needed by the Cooperative Saving and Payment Unit, including the application of saving management and financing, enhancing the cooperative’s web, and m-Sijam cooperatives. Users of the savings and financing management application are credit managers, managers, general divisions and financial divisions. Meanwhile, web users of cooperatives and m-Sijam cooperatives are the general public, members of cooperatives, and managers. Explanation of each application design can be seen in Table 15.

| Application Name             | Function                                                                 |
|------------------------------|--------------------------------------------------------------------------|
| Saving and Payment Management Application | Manage data on saving and financing, including managing data on members’ deposits, loans, installments from member loans and bills per faculty or per member. In addition, this application can view reports on the results of savings and financing units. Management that can be done such as adding, deleting, and updating data. |
| Cooperative Web (website)    | Register as a member, see data on savings transactions, loans, installments and bills owned by a cooperative member. In addition, users can apply for loan funds that will later be confirmed by the credit manager, make bill payments in installments or deposits by uploading proof of payment, which will also be confirmed by the credit manager. |
| m-Sijam Cooperative (mobile) | Use case diagrams are formed by combining all applications that will be designed in the Saving and Payment Unit. The application merger is done because there is still a link between the management application that is accessed by the credit manager and the member application. Thus, it will be easier to see the linkages in the information system that runs in the Saving and Payment Unit. Actors involved in the system include prospective members, members, general divisions, credit managers, financial divisions, and managers. The results of the use case diagram design can be seen in Figure 16. The interface design is designed to provide an understanding of the functions available in the application. Meanwhile, the interface is used to bridge between the user and the application itself. Each of the applications designed has an interface that can support data processing. Examples of the appearance of the interface design in the store management and financing application can be seen in Figure 17, the Cooperative web in Figure 18, and the M-Sijam application in Figure 19.
Figure 14. Class Diagram Design
Figure 15. Use Case Application Design
Figure 16. Home Interface Design in Management and Financing Management Applications

Figure 17. Bill Interface Design on KIPI Diponegoro University Web
4.8. Testing
The results of data design and application have been tested by Diponegoro University KPRI Manager, Drs. Setyo Wardoyo. Testing is done by displaying blueprints of business, data and applications that have been designed, directly at the KPRI Diponegoro University secretariat. The test results were approved by the Diponegoro University KPRI, because it was in accordance with the goals and desires of the Diponegoro University KPRI. Furthermore, the draft results will be used as a reference in designing future information systems in the Diponegoro University KPRI Saving and Payment Unit.

4.9. Closing
Analysis of the design of information systems architecture using the TOGAF framework, with phases used namely the preliminary phase, architecture vision, requirements management, and information systems architecture. Architectural design is done by analyzing business conditions and information systems namely current data and applications and desired targets based on interviews and observations. The results of the design of business architecture and information systems namely blueprint which explains the Diponegoro University KPRI Saving and Payment business services and stakeholders who play a role in business processes with the support of data architecture and application architecture. In business architecture blueprints produce catalogs and diagrams that discuss the alignment of business processes such as the process of member registration, payment and savings management, loan application and management, and payment and installment management with information systems. Data architecture results in new data design. The solution provided can support data integration or data usage together to access the application architecture designed. Whereas, the application architecture design produces a solution for storing and financing management applications, enhancing the features and functions of the Diponegoro University KPRI web, and designing the m-Sijam KPRI Diponegoro University for mobile-based members.

From the research that has been done, suggestions that can be given for further research development are expected to be able to explain the next phases of the TOGAF which are a unified whole, such as opportunities and solutions migration planning, implementation governance, and architecture change management.

Figure 18. Home Interface Design in M-Sijam Applications
References
[1] The Open Group 2009 *The Open Group Architecture Framework (TOGAF) Version 9*
[2] Fri D A 2007 *Enterprise Architecture. Air Force Journal of Logistics* 4 p 1-9.