Abstract. Enterprise architecture (EA) Information system (IS) is a strategic one that is used to improve the quality of service of an institution, by harmonizing organizational business processes and information technology. Technology that is developing very fast and is widely used by people today is Android. This research involves SI which can be used in the Android operating system for the management of an organization. The purpose of this study is to design the EA IS model using a TOGAF framework that analyzes the overall search and loan business processes carried out by members and librarians. Then the EA model is used as a guide to making an Android-based information system. Data collected are primary and secondary data in the library. Data is then analyzed using a Value chain. The results of the value chain analysis were analyzed again using Togaf ADM. The results of the analysis are EA models which include business architecture models, data architectural models, and application architecture models which consist of member registration processes, search processes, loan transaction processes and return transaction processes. The EA model is then used as a guide to making an Android-based library management application with an online database. The benefit of implementing an online database-based mobile application is the reduced time spent on borrowing by members because the process can be done online. Likewise, the time to respond to online borrowing is faster and easier, because the process can be done using an Android smartphone.

Keywords: Enterprise architecture, information system, Togaf Adm, Android Mobile Application.

1. Introduction

Information system (IS) is a strategic one that is used to develop business [1] [2] [3] [4] which involves aligning between organizational business processes with information technology (IT) [5] [6] [7]. Improving the quality of an institution does not just happen, to improve the quality of an institution requires appropriate strategic planning [8]. This is because strategic planning is used to improve the performance and quality of an institution. Based on several previous studies, SI is a solution in terms of decision making [9], the system has real-time information accessibility [10], is very accurate [11], effective data management [12] [13], and reduces risk in operational activities [14]. To fulfill and realize this strategy, several approaches are needed, namely, modeling of Enterprise Architecture (EA) SI. The aim of EA is to implement SI software but to achieve this goal, a broader view is needed, covering strategic, business, and organizational aspects [15]. SI technology, besides being used for efficiency and effectiveness, is also used to win the competition [16]. The selection of the framework for modeling EA SI in each organization varies and depends on the characteristics, the focus of the vision and mission and the objectives to be achieved by the organization. Organizations that do not have an EA model and require EA development methods that are easy, clear, detailed and flexible, the recommended framework is TOGAF [17]. TOGAF is a framework and method for EA that provides a methodology for analyzing overall business architecture which is then integrated with SI Technology [18]. Sala one technology that is developing very fast and is widely used by people today is Android. Android is an operating system (SO) based on Linux that is open source. SO is developed by Google to operate smartphones and tablet computers. This research involves SI applications that can be used in the Android (OS) operating system for the management of an organization. Android-based SI application is an interface that can be used to simplify various jobs. SO android was developed to provide users with ease and speed in various activities [19], such as activities in the library. Activities at the Muhammadiyah North Maluku University (UMMU) library Indonesian have been computerized by using Microsoft Office Word and Microsoft Office Excel, which are operated using a single personal computer unit, and there is no good data management SI application that causes the information needed to be late, of course just felt unprofitable and problems arise, such as the slow pace of doing the process of searching for data books, the loan process and the process of returning books. In addition, the level of errors that occur in the process of recording book lists and visitors is very high, because the processed data is overlapping. Not to mention a large amount of work that must be completed using one unit of personal computers that the library has. Problems like this can reduce the level of effectiveness and efficiency. Some studies show an increase in the efficiency and effectiveness of searching and borrowing books in libraries that use Android smartphones. The Android mobile application is used as an alternative media search library collection and online loan services, after which members of
the library come to the library to take books without having to wait and queue [20]. The android application is used to help customers access information and requests without a computer or librarian, but through their Android device, which can save their time and energy [21]. This condition can increase efficiency and effectiveness in terms of searching and borrowing online conducted by members, but there are no media that can be used by librarians to respond to requests for borrowing books online that are effective and efficient. The purpose of this study is to design an EA model using a TOGAF framework that analyzes the overall search and loan business processes carried out by members and librarians. Then the EA model is used for making Android-based information system applications. The android application can later be used by members to search and borrow books, while librarians can later use the application to manage data and respond to borrowing books by members online.

2. Methods

2.1 Data collection and analysis
The data collection was conducted at UMMU library in Ternate City, North Maluku province, Indonesia in January 2018 to February 2018. The data is primary data and secondary data. The primary data used is the result of direct monitoring of business processes that occur in the UMMU library. While secondary data used include documents obtained in the UMMU library. The primary data obtained is then analyzed using value chain analysis. Secondary data and results data from the value chain analysis are then analyzed using the Togaf ADM framework. The results of the Togaf ADM analysis are enterprise architecture models which are then used as guidelines for making mobile applications and online databases.

3. Results and Discussion

3.1. Value Chain Analysis
The value chain is used to identify and group activities in an institution into two categories, namely the main activities and supporting activities [22]. The following results from grouping activities in the UMMU library using value chain analysis.

<table>
<thead>
<tr>
<th>Supporting Activities</th>
<th>Main Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archive Documentation Process</td>
<td>Operational Services</td>
</tr>
<tr>
<td>Payroll and Financial Management Process</td>
<td>Circulation Services</td>
</tr>
<tr>
<td>Staffing Process</td>
<td></td>
</tr>
<tr>
<td>Facilities and Infrastructure Management Process</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. Value chain analysis

Grouping using value chain analysis produces the main activities, namely operational services, and circulation services. Operational services include a new member registration process and a book search process. While circulation services consist of the process of borrowing collections and the process of returning collections.

3.2. Business Architecture
Based on the results of grouping using value chain analysis, then the business process analysis is carried out in the main value chain activities to produce a new business architecture model.

3.2.1. Business Architecture Model Search and Loan Books by Members
The proposed business process improvement based on the process of searching and borrowing books at UMMU library in Ternate is by creating a mobile application system that can be used for the book search process as well as the process of borrowing books online by members before or after the member reaches the library. Business Architecture Model The process of searching and borrowing the proposed book can be seen in Figure 2.

![Figure 2. Business Architecture Model The proposed search and loan process](image-url)
a message from the officer. After that, the officer saves the
borrowing data in the online database.

3.2.2. Business Architecture Model New Member Registration

Proposed improvements based on the registration process of new members in the UMMU library in Ternate is to make
the mobile application system in a member database connection that can be used by prospective members to register online, then the registered member reports to the
library officer to get a membership card. Business Architecture Model Registration process The proposed new member can be seen in figure 3.

The process starts with students registering using a mobile
application. The system checks the data entered with the data
stored in the database. If the data has been registered in the
database then the process is stopped. Conversely, if the
student is not yet registered, then the data entered is stored in the
database. After the registration process is complete,
members are required to come directly to the library to report
to the library officer. The clerk checks member data to make
sure the member has actually registered. Then the officer
creates a member card and submits it to the new member who has registered.

3.2.3. Book Returns Business Architecture Model

Proposed improvements based on the process of returning
the current book in the UMMU library in Ternate is by
creating and integrating lending databases with database
returns to reduce the time of searching for loan data during
the return process and reducing fines. The proposal to
improve the book return process can be seen in Figure 4.

The return process begins with the borrower coming directly
to the library with the book he wants to return. The clerk
performs a previous loan data search and checks the fine
using an android application that is connected to the online
database. If the member is late in returning the book, the
member is required to pay a fine. Furthermore, if the member
extends the loan date, the officer conducts the loan data input
again. If not, then the data input officer returns on the mobile
application and returns the member library card.

3.2.4. Class diagram

Class diagrams are used to describe data models in the form
of entities, attributes, and relations. Class diagrams are also
useful for showing relationships between classes in a system.
The following is a picture of the design:

![Figure 4. Proposed Improvement of the Business Architecture Model of the Book Returns process](image)

![Figure 5. Class Diagram](image)
3.3. Modeling Information System Architecture

3.3.1. Data architecture model
The data architecture describes the entities, attributes, and relations, the steps to define the data architecture as follows:
- Defines prospective entities
- specify the entity to be used
- define each entity
- connect between data entities

The first step in defining data architecture is to define prospective data entities that contain data sets in institutions, such as the following:

<table>
<thead>
<tr>
<th>Business Activities</th>
<th>Prospective entity data</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Member Registration Process</td>
<td>Member Entity</td>
</tr>
<tr>
<td></td>
<td>Student Entity</td>
</tr>
<tr>
<td></td>
<td>Officer Entity</td>
</tr>
<tr>
<td>Book Search Process</td>
<td>Member Entity</td>
</tr>
<tr>
<td></td>
<td>Book Entity</td>
</tr>
<tr>
<td></td>
<td>Order Entity</td>
</tr>
<tr>
<td></td>
<td>Borrowing Entity</td>
</tr>
<tr>
<td>Book Loan Transaction Process</td>
<td>Member Entity</td>
</tr>
<tr>
<td></td>
<td>Book Entity</td>
</tr>
<tr>
<td></td>
<td>Borrowing Entity</td>
</tr>
<tr>
<td></td>
<td>Officer Entity</td>
</tr>
<tr>
<td>Book Return Transaction Process</td>
<td>Member Entity</td>
</tr>
<tr>
<td></td>
<td>Borrowing Entity</td>
</tr>
<tr>
<td></td>
<td>Returning Entity</td>
</tr>
<tr>
<td></td>
<td>Officer Entity</td>
</tr>
</tbody>
</table>

3.3.2. Application architecture model
Making application architecture models for the UMMU library, using the Use Case Diagram tools. Use Case Diagrams are used to describe who are the actors involved in the application process, what can be done by actors on the application, and show the interaction of each actor against the existing application. There are two architectural designs that are needed by the UMMU library. Namely: application processing and circulation applications. The following is an explanation of each design of the application:

<table>
<thead>
<tr>
<th>No</th>
<th>Application Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Processing</td>
<td>Library data processing, managing new member data, processing fine data, borrowing and returning data processing.</td>
</tr>
<tr>
<td>2.</td>
<td>Circulation</td>
<td>Borrowing collections, returning collections, extending collections, checking the number of fines and collecting late collection.</td>
</tr>
</tbody>
</table>

3.3.2.1. Use Case Diagram of Application Processing
The processing application architecture has two actors and eight use cases. The actors involved are officers and members. The use cases involved in the system are searching for books, borrowing, returning, calculating fines, paying fines, logging in, storing loan data, and storing return data.

3.4. Implementation and Testing

3.4.1. Implementation

3.4.1.1. Login Page

Figure 6. Use Case Processing Application Diagram

Figure 7. Use Case Circulation Application Chart

Figure 8. Login Page
The login page is used by users to be able to enter the application and access the resources in the application. Login is done by entering the username and password that the user has. Only those who have been registered as active users have successfully logged in. If the login process is done using an admin account, the application enters the main menu and the user can enter data, change data, delete data, respond to borrowing books online, etc. If the login process is done using a user account, the application enters the book search page and the user can only search books, borrow online and view the data of books borrowed.

3.4.1.2. Search page

Search pages are used by users to search book data. Users can view book details by clicking on the book title on the search page. The process of borrowing online can be done by the user by clicking the borrow button on the book details page.

3.4.1.3. Data order page

The order data page is used by the user to view the book data ordered. To display the page can be done by clicking the data order tab at the bottom of the page. This page contains the title of the book and a description of success or process to notify the user that the book ordered is ready to be taken or not.

3.4.1.4. Data Loan page

The borrowed data page is used by the user to view the databooks that have been borrowed and see the date of returning the book that the user must do.

3.4.1.5. Admin main page

This main page appears when the user successfully logs in using an admin account. This page is used to call on functions that exist in the application, such as data processing functions borrowing returns, orders, etc.

3.4.1.6. Order data processing page
This page appears when the data order button on the main page is clicked. This page is used by the admin to manage online loan data that has been done by the user. The data that appears on this page is the order code, member name, book title, shelf and the rest of the book. The online loan data can be used by the admin to prepare borrowed books.

3.4.1.7. Order detail page

![Order detail page](image)

This page is used by the admin to display details of online loan data. This page appears when the borrowing data that is on the data order page is clicked. On this page, there is one successful button. The button is used to notify the user that the book borrowed is ready and may be taken now.

3.4.1.8. Loan page

![Loan page](image)

This page appears when the borrow button on the main page is clicked. This page is used to display loan data that was done previously. Admin can also use this page to delete, change, add to borrow books and process the return of books.

3.4.2. Testing the system using black box

Testing is done using a black box by testing the system in terms of system functionality. The system functionality tested is based on the use case at the design stage. The test is divided into twelve parts. Each part is tested according to the use case scenario at the design stage. The testing process uses a smartphone that has Android OS version 6.0.1 Marshmallow installed. The test results carried out using black box state that the system built is in accordance with the design or model made before.

4. Conclusion

Based on the results of the discussion, the following conclusions are obtained:

- An enterprise architecture model is produced which includes business architecture, data architecture and application architecture which consists of online borrowing and online loan data management, which is then used for the development of online database-based android application systems.
- Online database-based mobile applications can reduce the borrowing time of members because the process can be done online. Likewise, the time to respond to online borrowing is faster and easier, because the process can be done using an Android smartphone.
- The mobile application can facilitate services and improve the quality of education in accordance with the vision, mission, and goals of the organization.

References


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