

Software Requirements Specification (SRS) for Pocket Banking (PB)

Baseline version 1.0

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Table of Contents

CHAPTER 1 INTRODUCTION	6
1.1 Purpose	6
1.2 Scope	6
1.3 Definitions, Acronyms, and Abbreviations	6
1.4 Overview	7
CHAPTER 2 GENERAL DESCRIPTION	8
2.1 Product Perspective	8
2.2 Product Functions	8
2.3 User Characteristics	8
2.4 General Constraints	9
2.5 Assumptions and Dependencies	9
CHAPTER 3 SPECIFIC REQUIREMENTS	10
3.1 Enumerated Functional Requirements	10
3.2 Enumerated Non-Functional Requirements	11
3.3 On-Screen Enumerated Requirements	11
3.4 Classes/Objects	15
CHAPTER 4 FUNCTIONAL REQUIREMENTS SPECIFICATION	16
4.1 Stakeholders	16
4.2 Actors and Goals	16
4.3 Use Case	16
4.4 Traceability Matrix	25
4.5 Activity Diagram	27
UC-1 Register Customer's Account	27
UC-2 Log in into Customer's Account	28
UC-3 Apply to Link Bank Account	29
UC-4 View Balance	30
UC-5 View Transaction History	30
UC-6 Transfer to Another Account	31
UC-7 Manage Bill Payment	32

UC-8	Export Electronic Statement	35
UC-9	View Nearby ATM Locations	35
UC-10	Manage Account Link Applications	36
4.6	Sequence Diagram.....	37
UC-1	Register Customer's Account	37
UC-2	Log in into Customer's Account.....	38
UC-3	Apply to Link Bank Account.....	40
UC-4	View Balance	40
UC-5	View Transaction History	41
UC-6	Transfer to Another Account	41
UC-7	Manage Bill Payment.....	42
UC-8	Export Electronic Statement	44
UC-9	View Nearby ATM Locations	45
UC-10	Manage Account Link Applications	45
4.7	Use Case Test Plans	46
UC-1	Register Customer's Account	46
UC-2	Log in into Customer's Account.....	49
UC-3	Apply to Link Bank Account.....	51
UC-4	View Balance	52
UC-5	View Transaction History	52
UC-6	Transfer to Another Account	53
UC-7	Manage Bill Payment.....	55
UC-8	Export Electronic Statement	58
UC-9	View Nearby ATM Locations	59
UC-10	Manage Account Link Applications	59
CHAPTER 5 PROJECT MANAGEMENT PLAN		62
5.1	Use Case Weight	62
5.1.1	Unadjusted Use Case Weight.....	62
5.1.2	Unadjusted Actor Weight	63
5.1.3	Technical Complexity Factor.....	63
5.1.4	Environmental Complexity Factor.....	64

5.1.5	Use Case Point Calculation.....	64
5.2	COCOMO	64
5.2.1	Unadjusted Function Points	64
5.2.2	COCOMO	65
5.3	Activity Table.....	66
5.4	Gantt Chart	70
5.5	Critical Path.....	70
	APPENDICES.....	71

CHAPTER 1

INTRODUCTION

1.1 Purpose

The purpose of this SRS document is to provide information regarding *Pocket Banking*, including its description, objective, requirements, features as well as its operating constraints. This document is intended for both stakeholders and developers of the system and will be proposed to the client for approval.

1.2 Scope

Pocket Banking is a mobile software system to assist bank customers in viewing their account details or managing their payments with the convenience of being able to do so anywhere and anytime.

The software will allow customers to apply for a bank account or manage transactions in their existent accounts. PB also provides other banking services which are normally only possible by visiting a physical bank branch, such as obtaining an electronic statement of previous transaction and balance history.

PB is limited only to the software aspect and assumes the required hardware is already existent. The services provided in the system will be discussed in more detail in further sections.

1.3 Definitions, Acronyms, and Abbreviations

Term/Acronym	Definition	Description
PB	Pocket Banking	The name of the system being made
SRS	Software Requirement Specification	This document
Customer	A person with an existent bank account or one applying for an account	Refers to the user using the provided banking services
Bank	A financial institution licensed to receive deposits and make loans	Refers to the organization verifying submission of applications
Bank Account	A financial account maintained by a bank for a customer	Required by the system to access account-specific services
Electronic Statement	An electronic version of a banking statement detailing past transaction and balance history	Refers to the exportable document detailing transaction history
ATM	Automated Teller Machine	Refers to the banking outlets whose locations can be viewed from the system

System	A set of things working together as an interconnecting network	Refers to the system Personal Banking as a whole
User	A user of the system	Refers to Customer and Bank

1.4 Overview

This document will provide a general overview of the system being made. It covers none other than the system's functions and constraints, non-functional requirements, functional requirement, use cases, test plans and project plan.

CHAPTER 2

GENERAL DESCRIPTION

2.1 Product Perspective

The use of mobile banking has been rising as a complement for web banking, ATMs and traditional bank tellers. Similar applications by other banks include BCA Mobile and Citi Mobile. Our system will provide similar functions, with the added security of biometric authentication for logging in and the ability to link to their existent bank accounts, similar to the functions provided by the mobile applications “Jenius” and “CIMB Clicks”.

2.2 Product Functions

The system will perform the following functions:

1. Allow the customer to log in using either the registered password or biometric authentication
2. Allow the customer to submit applications to link their PB accounts to an existent bank account
3. Provide access for the customer to banking services, such as viewing one’s own account balance and transferring funds to other accounts
4. Provide a way the customer to make bill payments
5. Provide a way for the customer to export an electronic statement detailing past transaction history to the user’s email.
6. Provide a way for the customer to view nearby ATM locations in a certain area

2.3 User Characteristics

The user consists of two main actors: **Customer** and **Bank**.

The **Customer** is expected to be Internet-literate and to use the system on an Android-operated phone with a working fingerprint scanner. The **Customer** is also expected to be Internet-literate and able to enable GPS and location services.

The **Bank** is expected to be Internet-literate and able to use interfaces such as buttons and menus.

2.4 General Constraints

The application will be built on the Android platform, and data storage will be built on a cloud server. The language used in the application is English.

To access full functionality of the system, a working and secure Internet connection is required. The feature to view ATM locations requires GPS and location services enabled, while a working fingerprint scanner is required to use the supported biometric authentication.

The information stored in the system, those submitted by the customer or provided by the bank, will be stored safely and confidentially, adhering to the associated privacy and confidentiality laws.

2.5 Assumptions and Dependencies

The system is built on the Android platform and requires a working fingerprint scanner for biometric authentication. The system also requires an Internet connection for full functionality to the provided services. The system is built on the assumption that the customer's mobile phone can load and maintain PB without interruption during its use.

CHAPTER 3

SPECIFIC REQUIREMENTS

3.1 Enumerated Functional Requirements

Identifier	P.W.	Description
REQ-01	5	System shall allow an unregistered Customer to provide personal information and create an account.
REQ-02	5	System should be able to correctly identify the Customer from their Customer ID.
REQ-03	5	System should be able to correctly identify the Customer from their biometric ID.
REQ-04	5	System shall allow a registered Customer to link their accounts to their existent bank accounts.
REQ-05	5	System shall allow display of Customer's account balance.
REQ-06	5	System shall allow display of transaction (fund transfer and bill payment) history.
REQ-07	5	System shall allow a Customer to transfer funds to another account.
REQ-08	4	System shall allow a Customer to make a new bill payment, modify or remove a scheduled payment.
REQ-09	2	System shall allow export of Customer's electronic statement detailing past transaction and balance history.
REQ-10	3	System shall allow display of nearby ATM locations.
REQ-11	5	System shall allow Bank to view submitted bank account link applications.
REQ-12	5	System shall allow Bank to approve or reject submitted bank account link applications.
REQ-13	5	System should be able to connect to the Internet.
REQ-14	3	System should be able to access GPS.
REQ-15	5	System shall allow any user to input biometric ID to allow login and other features.

3.2 Enumerated Non-Functional Requirements

Identifier	P.W.	Description
REQ-16	4	The information stored must comply bank confidentiality obligations grounded in Law No 7 of 1992 regarding Banking.
REQ-17	4	The information stored can only be provided to other parties for personal parties with a written approval from the Customer as according to the BI regulation No. 7/6/PBI/2005.
REQ-18	4	Any established connection must be encrypted.
REQ-19	5	System shall be accurate when providing transaction history.
REQ-20	3	System shall display all ATM locations at a maximum radius distance of 5 km from the device's location or the specified location.
REQ-21	4	System shall have a user interface which is easy to understand for the user.
REQ-22	5	System shall periodically back up data.
REQ-23	5	System can enable Internet connection and maintain a stable connection.
REQ-24	3	System can enable GPS access on the device.
REQ-25	2	System can enable file writing access on the device.
REQ-26	4	System shall request processing of the bill payment from the Bank immediately if the scheduled payment date is the same as the date of transaction.
REQ-27	4	System shall request processing of bill payments from the Bank at the start of the scheduled day if the scheduled payment date is different from the date of transaction.

3.3 On-Screen Enumerated Requirements

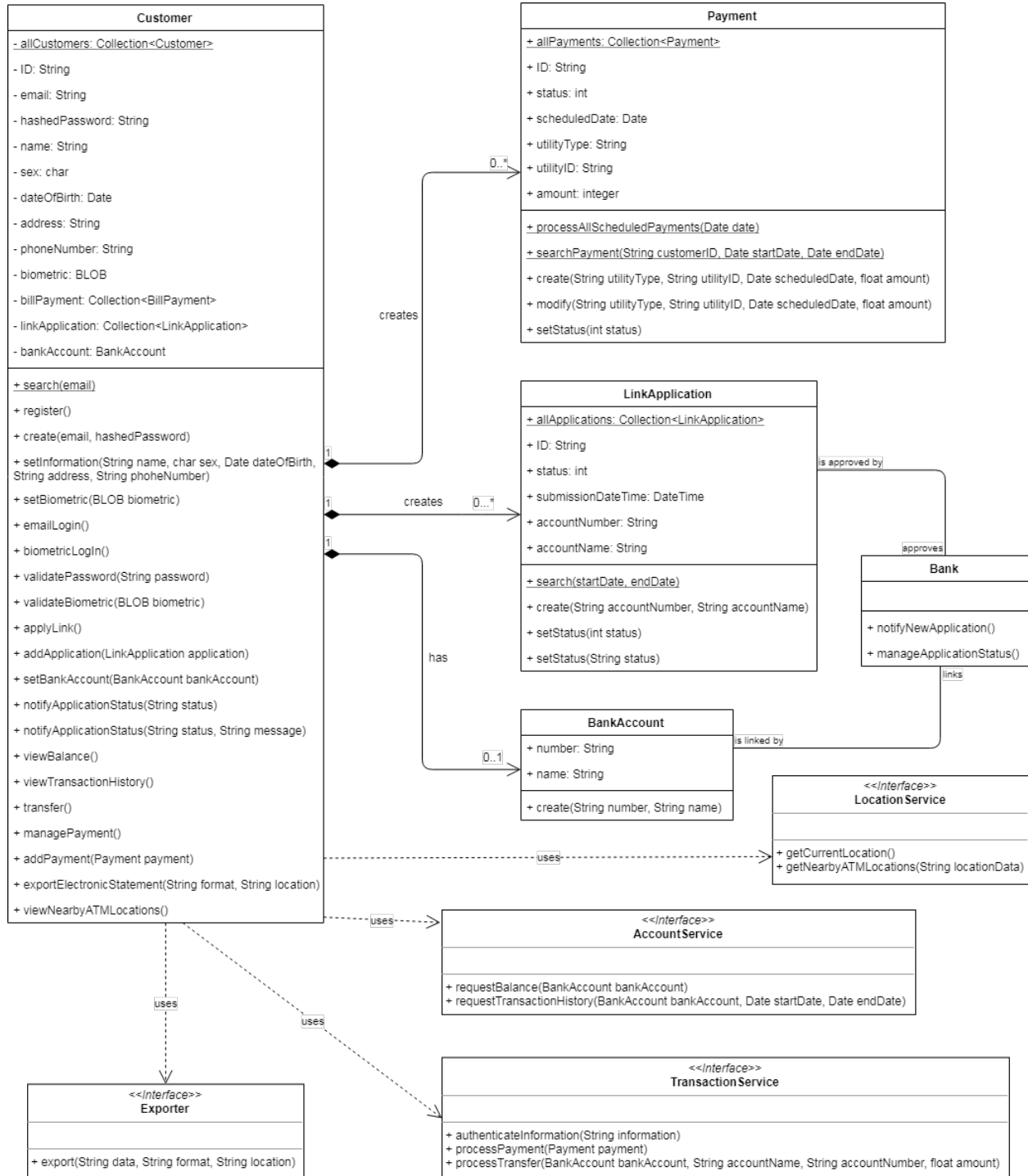
Identifier	P.W.	Description
REQ-28	5	To create a PB account, the Customer needs to use a device with Internet access to use the application. The Customer selects "Register" and the system displays a form to be filled with the desired e-mail address and password. The Customer selects the "Submit" button and the data will be submitted and validated.

		<p>After validation, the system will display another form to be filled in with personal information for the account. The Customer then selects the “Submit” button and the information will be validated again. If validation is successful and if the device possesses biometric capabilities, a prompt will appear asking the Customer to input a biometric ID.</p> <p>The Customer is then brought to the “Bank Account” menu after successful registration.</p>
REQ-29	5	<p>To log into a PB account, the Customer opens the application and selects “Log In”. A login screen appears, and the Customer can choose either the “Login using biometric ID” button or the “Login using e-mail” button.</p> <p>If the Customer chooses “Login using Biometric ID”, the Customer can choose biometric identification to log in. If the Customer chooses “Login using E-mail”, the system displays a form to be filled with the e-mail address and password.</p> <p>If incorrect log-in information is inputted, an error message “Incorrect log-in information” is displayed. If the maximum log-in attempt is reached, an error message “Maximum log-in attempt reached” is displayed.</p> <p>If correct log-in information is inputted, the Customer will be brought to the main application menu.</p>
REQ-30	5	<p>To link an existent bank account, the Customer selects the “Bank Account” menu. The Customer selects “Link Existent Bank Account” and the system will display a form to be filled with the account number and the name associated with the account. After filling the form, the Customer selects “Submit”.</p> <p>If the form submission is incomplete, an error message “Incomplete submission” will be displayed, and the Customer is brought back to the form.</p> <p>If the form is correctly filled, a message “Request form successfully submitted” will be displayed and the Customer is brought back to the “Bank Account” menu.</p>
REQ-31	5	<p>To view current account balance, the Customer selects the “Bank Account” menu and if the PB account is already linked to a bank account, the Customer can choose “View Account Balance” to display a screen with the current account balance.</p>

REQ-32	5	<p>To view transaction history, the Customer selects the “Bank Account” menu and if the PB account is already linked to a bank account, the Customer can choose “View Transaction History” to display a screen with a list of past transactions, which includes fund transfers and bill payments. The Customer can also choose to filter the list based on the start date and the end date of the transactions displayed.</p>
REQ-33	5	<p>To transfer funds to another account, the Customer selects the “Transfer” menu. The system will display a form to be filled with the receiver’s account name and number as well as fund amount.</p> <p>If the form submission is incomplete, an error message “Incomplete submission” will be displayed, and the Customer is brought back to the form.</p> <p>If the form is correctly filled, a message “Transfer successfully processed” will be displayed and the Customer is brought back to the main account menu.</p>
REQ-34	4	<p>To manage a bill payment, the Customer selects the “Payments” menu. The system will display a list of active scheduled bill payments.</p> <p>1. If the Customer selects “Make New Payment” and the system will display an option where the Customer can choose the scheduled payment date and type of utility bill to be paid. After the Customer chooses the desired type and date, the system will display a form to be filled with the utility ID and payment amount.</p> <p>If the form submission is incomplete, an error message “Incomplete submission” will be displayed, and the Customer is brought back to the form.</p> <p>If the form is correctly filled, a message “Payment successfully processed” will be displayed and the Customer is brought back to the “Payments” menu.</p> <p>2. If the Customer selects one of the payments in the list, the Customer can choose “Modify” or “Remove”. If the Customer selects “Modify”, the system will display a form to be filled with the modified information.</p> <p>If the form submission is incomplete, an error message “Incomplete submission” will be displayed, and the Customer is</p>

		<p>brought back to the form.</p> <p>If the form is correctly filled, a message “Payment successfully modified” will be displayed and the Customer is brought back to the “Payments” menu.</p> <p>3. If the Customer selects “Remove”, the system will prompt a confirmation message. If the Customer confirms the removal, a message “Payment successfully removed” will be displayed and the Customer is brought back to the Payments menu.</p>
REQ-35	2	<p>To export an electronic statement, the Customer selects the “Bank Account” menu and if the PB account is already linked to a bank account, the Customer can choose “Export E-Statement”. The system will display a menu with a list of formats for the exported electronic statement. After the Customer selects the desired format, the system displays another menu for the export location. The Customer chooses the desired export location and selects the “Export” button. A message “E-statement successfully exported” appears and the Customer is brought back to the “Bank Account” menu.</p>
REQ-36	3	<p>To view nearby ATM locations, the Customer selects the “ATM” menu. The system will display a map based on the device’s current location and the nearby ATM locations within a certain distance. The Customer can navigate through the map to change the viewed location.</p>
REQ-37	5	<p>To manage submitted bank applications, the Bank selects the “Manage Account Link Applications” menu. The system will display a list of submitted account link applications, which can be filtered based on start and end dates of the submissions. If the Bank selects one of the applications, the system will display a menu where the Bank can choose to either approve or reject the application.</p> <p>If the Bank chooses to approve the application, the system will prompt a confirmation message. If the Bank confirms the approval, a message “Application approved” will be displayed.</p> <p>If the Bank chooses to reject the application, the system will display a form to be filled with the reason for rejection. After the Bank submits the form, the system will prompt a confirmation message. If the Bank confirms the rejection, a message “Application rejected” will be displayed.</p>

3.4 Classes/Objects



CHAPTER 4

FUNCTIONAL REQUIREMENTS SPECIFICATION

4.1 Stakeholders

This system is created to be used for bank customers who would like to see their own account details and make transactions easily and quickly on their phones. This system will also allow the bank to link their customers' bank accounts to the accounts provided by the systems easily.

4.2 Actors and Goals

Actors	Goals
Customer	To register themselves into the system
	To log in into the system
	To apply to link their account to a bank account
	To view account balance
	To view account transaction history
	To transfer fund to another account
	To make a bill payment
	To export electronic statement
	To view nearby ATM locations
Bank	To manage account link applications

4.3 Use Case

Casual description

- 1. Register Customer's Account:** Allows a customer to register themselves as a customer in the system.
- 2. Log in into Customer's Account:** Allows a customer to log in into the system
- 3. Apply to Link Bank Account:** Allows a customer to submit an application to link their customer accounts to an existent bank account
- 4. View Balance:** Allows a customer with a linked bank account to view their balance
- 5. View Transaction History:** Allows a customer with a linked bank account to view their transaction history
- 6. Transfer to Another Account:** Allows a customer with a linked bank account to transfer funds to another bank account

7. **Manage Bill Payment:** Allows a customer with a linked bank account to make a new payment, modify or remove a scheduled payment
8. **Export Electronic Statement:** Allows a customer with a linked bank account to export an electronic statement detailing latest transaction history
9. **View Nearby ATM Locations:** Allows a customer to view nearby ATM locations around their current location
10. **Manage Account Link Applications:** Allows the bank to approve or reject submitted bank account link applications

Full-dressed description

Use Case UC-1	Register Customer's Account
REQ	REQ-01, REQ-02, REQ-03, REQ-13, REQ-15, REQ-16, REQ-17, REQ-18, REQ-21, REQ-22, REQ-23, REQ-28
Initiating Actor	Customer
Actor's Goal	To register the Customer's account into the System
Participating Actors	-
Preconditions	Customer is unregistered in the System .
Postconditions	Customer is registered in the System .
Normal course	<ol style="list-style-type: none"> 1. Customer selects the account registration menu. 2. System displays an initial registration form to request the Customer's e-mail address, password and password confirmation. 3. Customer fills up the form with the requested information. 4. Customer submits the initial registration form. 5. System searches for an existing account with the same e-mail address. 6. System validates the password. 7. System displays a registration form to request the Customer's personal information. 8. Customer fills up the form with the requested information. 9. Customer submits the registration form. 10. System validates the form. 11. System stores the Customer's account information. 12. System requests Customer's biometric ID. 13. Customer inputs biometric ID. 14. System stores the Customer's biometric ID.
Alternate course	<ol style="list-style-type: none"> 5a. An account with the same e-mail address exists. <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step 2. 6a. The password is invalid. <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step 2.

	<p>9a. The submitted form is invalid.</p> <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step 7. <p>11a. The device does not support biometric input.</p> <ol style="list-style-type: none"> 1. The process ends here.
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Use Case UC-2	Log in into Customer's Account
REQ	REQ-02, REQ-03, REQ-13, REQ-15, REQ-16, REQ-17, REQ-18, REQ-21, REQ-22, REQ-23, REQ-29
Initiating Actor	Customer
Actor's Goal	To log in into the System
Participating Actors	-
Preconditions	Customer has an account in the System .
Postconditions	Customer is logged in into the System .
Normal course	<ol style="list-style-type: none"> 1. Customer selects the account login menu. 2. Customer chooses to (A) log in with e-mail address or (B) log in with biometric ID. <ol style="list-style-type: none"> A. CASE: E-mail address <ol style="list-style-type: none"> A1. System displays a login form to request the e-mail address and password. A2. Customer fills up the form with the requested information. A3. Customer submits the form. B. CASE: Biometric ID <ol style="list-style-type: none"> B1. System prompts for biometric information. B2. Customer inputs biometric information. 3. System authenticates the login information. 4. Customer is logged in.
Alternate course	<ol style="list-style-type: none"> 3a. Login information is incorrect. <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step 2. 3b. Maximum login attempt count reaches its limit. <ol style="list-style-type: none"> 1. System displays an error message. 2. Customer's account is locked temporarily. 3. The process ends here. B1-a. The device does not support biometric input. <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step 2.

Use Case UC-3	Apply to Link Bank Account
REQ	REQ-04, REQ-13, REQ-16, REQ-17, REQ-18, REQ-21, REQ-22, REQ-23, REQ-30
Initiating Actor	Customer

Actor's Goal	To apply to link the Customer's account to an existent bank account
Participating Actors	-
Preconditions	Customer is logged in and has no linked bank account.
Postconditions	Customer has applied to link their bank account.
Normal course	<ol style="list-style-type: none"> 1. Customer selects the apply to link bank account menu. 2. System displays a form to request the account name and number. 3. Customer fills up the form with the requested information. 4. Customer submits the form. 5. System validates the submitted form. 6. System stores the account link application and marks it as pending approval. 7. System notifies the Bank of the submitted account link application.
Alternate course	<ol style="list-style-type: none"> 4a. The submitted form is invalid. <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step 2.

Use Case UC-4	View Balance
REQ	REQ-05, REQ-13, REQ-16, REQ-17, REQ-18, REQ-19, REQ-21, REQ-23, REQ-31
Initiating Actor	Customer
Actor's Goal	To view the Customer's account balance
Participating Actors	Bank
Preconditions	Customer is logged in and has an approved linked bank account.
Postconditions	Customer can view their account balance.
Normal course	<ol style="list-style-type: none"> 1. Customer selects the view balance menu. 2. System requests the balance value from Bank. 3. Bank returns the requested balance value. 4. System displays the balance of the linked bank account.

Use Case UC-5	View Transaction History
REQ	REQ-05, REQ-06, REQ-13, REQ-16, REQ-17, REQ-18, REQ-19, REQ-21, REQ-23, REQ-32
Initiating Actor	Customer
Actor's Goal	To view the Customer's transaction history
Participating Actors	-
Preconditions	Customer is logged in and has an approved linked bank account.
Postconditions	Customer can view their transaction history.
Normal course	<ol style="list-style-type: none"> 1. Customer selects the view transaction history menu. 2. System displays an option to filter transactions by their start

	and end dates. 3. Customer chooses the start and end dates. 4. System requests the relevant transaction history from Bank . 5. Bank returns the requested transaction history. 6. System displays a list of past transactions filtered by the start and end dates.
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Use Case UC-6	Transfer to Another Account
REQ	REQ-05, REQ-07, REQ-13, REQ-16, REQ-17, REQ-18, REQ-19, REQ-21, REQ-22, REQ-23, REQ-33
Initiating Actor	Customer
Actor's Goal	To transfer funds to another account
Participating Actors	Bank
Preconditions	Customer is logged in and has an approved linked bank account.
Postconditions	Customer can transfer funds to another bank account.
Normal course	1. Customer selects the transfer to another account menu. 2. System displays a form to request the fund amount and receiver's account name and number. 3. Customer fills up the form with the requested information. 4. Customer submits the form. 5. System validates the submitted form. 6. System sends the information to Bank and requests processing of fund transfer. 7. Bank authenticates the information. 8. Bank processes the fund transfer and records the transaction.
Alternate course	5b. The submitted form is invalid. 1. System displays an error message. 2. Go back to step 2. 7a. The inputted account name and/or number do not exist or do not match. 1. System displays an error message. 3. Go back to step 2. 7b. The account balance is insufficient to fund the transfer. 1. System displays an error message. 2. Go back to step 2.

Use Case UC-7	Manage Bill Payment
REQ	REQ-05, REQ-06, REQ-13, REQ-16, REQ-17, REQ-18, REQ-19, REQ-21, REQ-22, REQ-23, REQ-26, REQ-27, REQ-34
Initiating Actor	Customer
Actor's Goal	To make, modify or remove a bill payment
Participating Actors	Bank
Preconditions	Customer is logged in and has an approved linked bank account.

Postconditions	Customer can make, modify or remove a bill payment.
Normal course	<ol style="list-style-type: none"> 1. Customer selects the manage scheduled payment menu. 2. System displays a list of active scheduled bill payments. 3. Customer chooses to (A) make new payment, (B) modify a scheduled payment or (C) remove a scheduled payment. <p>A. CASE: Make new payment</p> <ol style="list-style-type: none"> A1. Customer selects the make new payment menu. A2. System displays an option to select the scheduled payment date and the type of utility. A3. Customer chooses the scheduled date and type of utility. A4. System displays a form to request the utility ID and payment amount. A5. Customer fills up the form with the requested information. A6. Customer submits the form. A7. System validates the form. A8. System submits the information to Bank for authentication. A9. Bank authenticates the information. A10. System records the bill payment. <p>B. CASE: Modify scheduled payment</p> <ol style="list-style-type: none"> B1. Customer chooses a scheduled payment from the list. B2. Customer selects the modify option. B3. System displays a form filled with current information. B4. Customer fills up the form with the modified information. B5. Customer submits the form. B6. System validates the form. B7. System submits the modified information to Bank for authentication. B8. Bank authenticates the information. B9. System updates the existing scheduled payment with the modified information. <p>C. CASE: Remove scheduled payment</p> <ol style="list-style-type: none"> C1. Customer chooses a scheduled payment from the list. C2. Customer selects the remove option. C3. System prompts a confirmation message. C4. Customer confirms removal. C5. System removes the existing scheduled payment.
Alternate course	<p>A7-a. The submitted form is invalid.</p> <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step A4. <p>A9-a. The utility ID does not exist.</p> <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step A4. <p>B6-a. The submitted form is invalid.</p>

	<ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step B3. <p>B8-a. The utility ID does not exist.</p> <ol style="list-style-type: none"> 1. System displays an error message. 2. Go back to step B3. <p>C4-a. Customer cancels removal.</p> <ol style="list-style-type: none"> 1. The process ends here.
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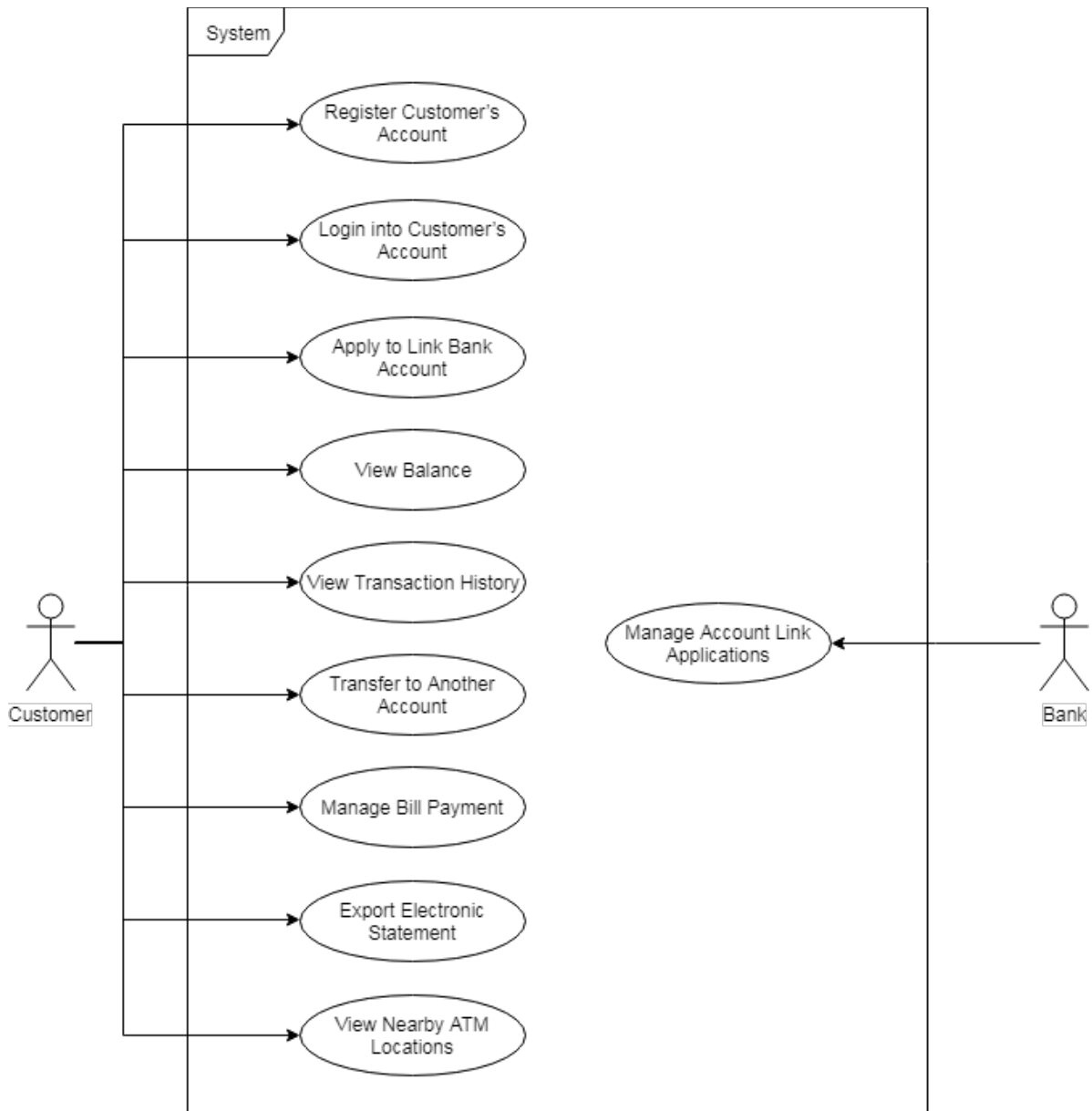
Use Case UC-8	Export Electronic Statement
REQ	REQ-09, REQ-13, REQ-16, REQ-17, REQ-18, REQ-19, REQ-21, REQ-23, REQ-25, REQ-35
Initiating Actor	Customer
Actor's Goal	To export an electronic statement detailing Customer's transaction history
Participating Actors	Bank
Preconditions	Customer is logged in and has an approved linked bank account. System has file writing permissions on the device.
Postconditions	Customer can export their electronic statement to their device.
Normal course	<ol style="list-style-type: none"> 1. Customer selects the export electronic statement menu. 2. System displays an option for the export format type. 3. Customer chooses the format type. 4. System displays a menu from which the export location can be selected. 5. Customer chooses the export location. 6. System requests the relevant transaction history from Bank. 7. Bank returns the requested transaction history. 8. System exports the transaction history as an electronic statement.

Use Case UC-9	View Nearby ATM Locations
REQ	REQ-10, REQ-13, REQ-14, REQ-18, REQ-20, REQ-21, REQ-23, REQ-24, REQ-36
Initiating Actor	Customer
Actor's Goal	To view nearby ATM locations from the device's location
Participating Actors	-
Preconditions	GPS in the device is activated.
Postconditions	Customer can view the nearby ATM locations.
Normal course	<ol style="list-style-type: none"> 1. Customer selects the view nearby ATM locations menu 2. System displays a map based on the device's current location and nearby ATM locations within a certain distance.

Use Case UC-10	Manage Account Link Applications
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REQ	REQ-11, REQ-12, REQ-13, REQ-16, REQ-17, REQ-18, REQ-21, REQ-22, REQ-23, REQ-37
Initiating Actor	Bank
Actor's Goal	To manage (approve or reject) the submitted link applications
Participating Actors	-
Preconditions	-
Postconditions	Bank can approve or reject submitted link applications.
Normal course	<ol style="list-style-type: none"> 1. Bank selects the manage account link applications menu. 2. System displays an option to filter applications by their start and end dates. 3. Bank chooses the start and end dates. 4. System displays a list of submitted bank link applications filtered by the start and end dates. 5. Bank chooses an application from the list. 6. System displays an option to approve or reject the application. 7. Bank chooses to approve or reject the application. 8. System displays a form to request reason for rejection if Bank chooses to reject the application. 9. Bank fills up the form with the requested information. 10. Bank submits the form. 11. System prompts a confirmation message. 12. Bank confirms approval or rejection. 13. System marks the application as approved or rejected. 14. System notifies Customer of the new application status.
Alternate course	<ol style="list-style-type: none"> 7a. Bank chooses to approve the application. <ol style="list-style-type: none"> 1. Skip to step 11. 9a. Bank cancels approval. <ol style="list-style-type: none"> 1. The process ends here.

Use Case Diagram



4.4 Traceability Matrix

Functional Requirements

REQ #	Use Case									
	1	2	3	4	5	6	7	8	9	10
1	1	0	0	0	0	0	0	0	0	0
2	1	1	0	0	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0	0	0
5	0	0	0	1	1	1	1	0	0	0
6	0	0	0	0	1	0	1	0	0	0
7	0	0	0	0	0	1	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	1	0	0
10	0	0	0	0	0	0	0	0	1	0
11	0	0	0	0	0	0	0	0	0	1
12	0	0	0	0	0	0	0	0	0	1
13	1	1	1	1	1	1	1	1	1	1
14	0	0	0	0	0	0	0	0	1	0
15	1	1	0	0	0	0	0	0	0	0

Non-Functional Requirements

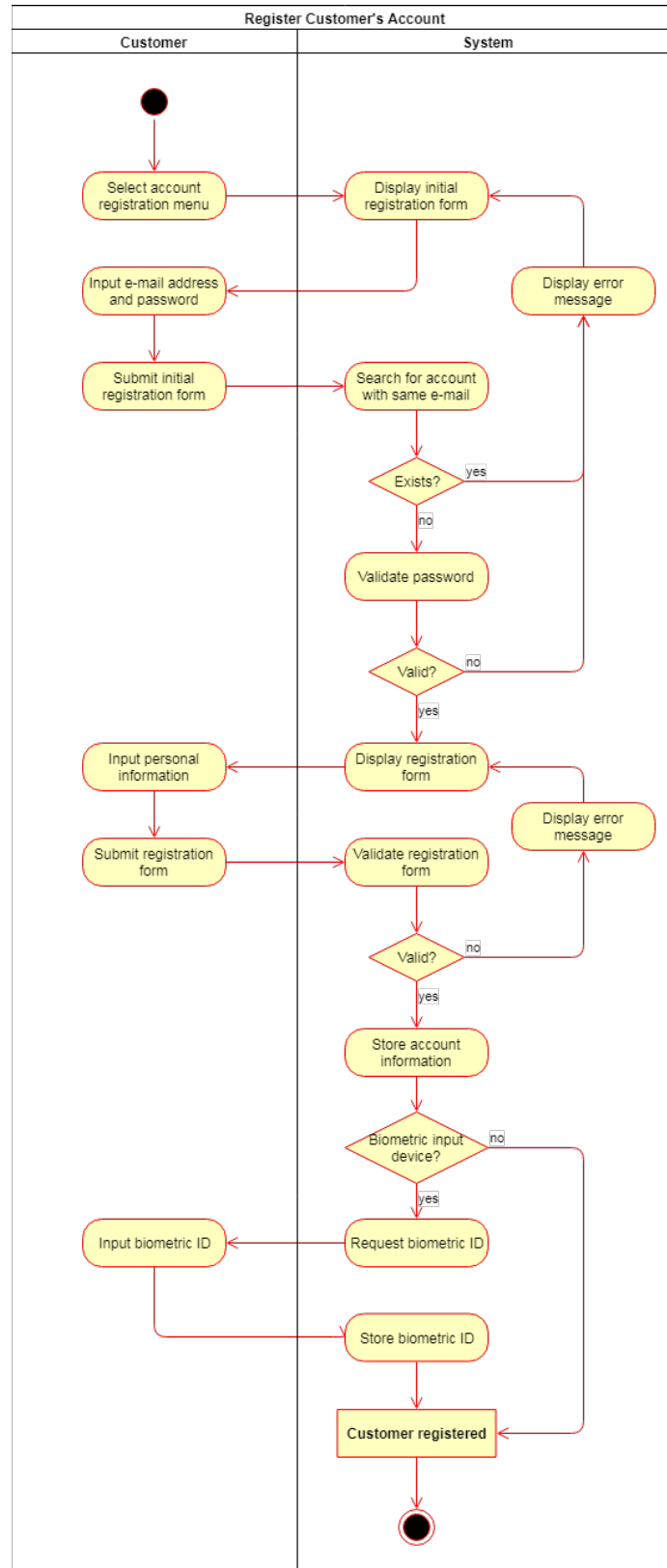
REQ #	Use Case									
	1	2	3	4	5	6	7	8	9	10
16	1	1	1	1	1	1	1	1	0	1
17	1	1	1	1	1	1	1	1	0	1
18	1	1	1	1	1	1	1	1	1	1
19	0	0	0	1	1	1	1	1	0	0
20	0	0	0	0	0	0	0	0	1	0
21	1	1	1	1	1	1	1	1	1	1
22	1	1	1	0	0	1	1	0	0	1
23	1	1	1	1	1	1	1	1	1	1
24	0	0	0	0	0	0	0	0	1	0
25	0	0	0	0	0	0	0	1	0	0
26	0	0	0	0	0	0	1	0	0	0
27	0	0	0	0	0	0	1	0	0	0

On-Screen Enumerated Requirements

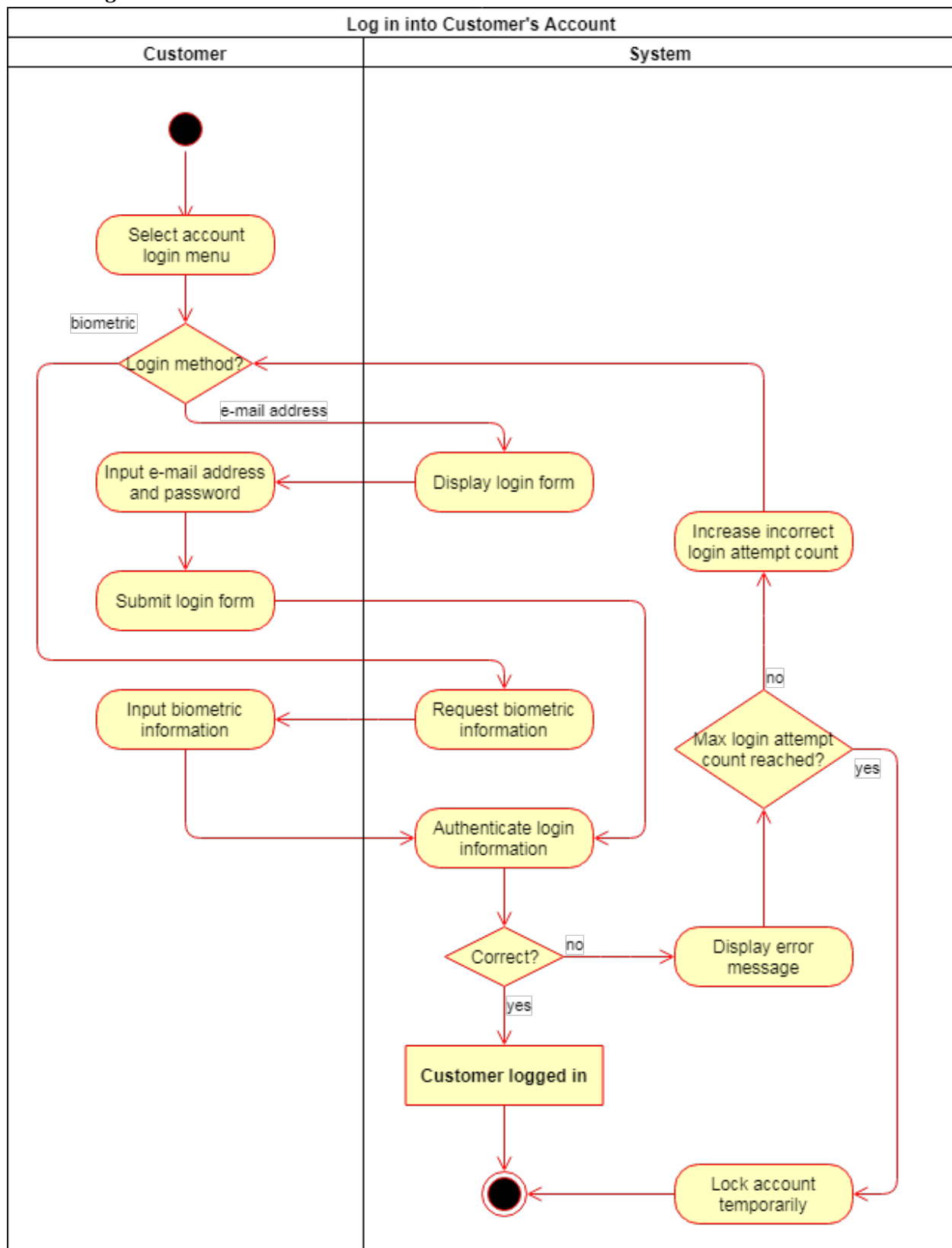
REQ #	Use Case									
	1	2	3	4	5	6	7	8	9	10
28	1	0	0	0	0	0	0	0	0	0
29	0	1	0	0	0	0	0	0	0	0
30	0	0	1	0	0	0	0	0	0	0
31	0	0	0	1	0	0	0	0	0	0
32	0	0	0	0	1	0	0	0	0	0
33	0	0	0	0	0	1	0	0	0	0
34	0	0	0	0	0	0	1	0	0	0
35	0	0	0	0	0	0	0	1	0	0
36	0	0	0	0	0	0	0	0	1	0
37	0	0	0	0	0	0	0	0	0	1

4.5 Activity Diagram

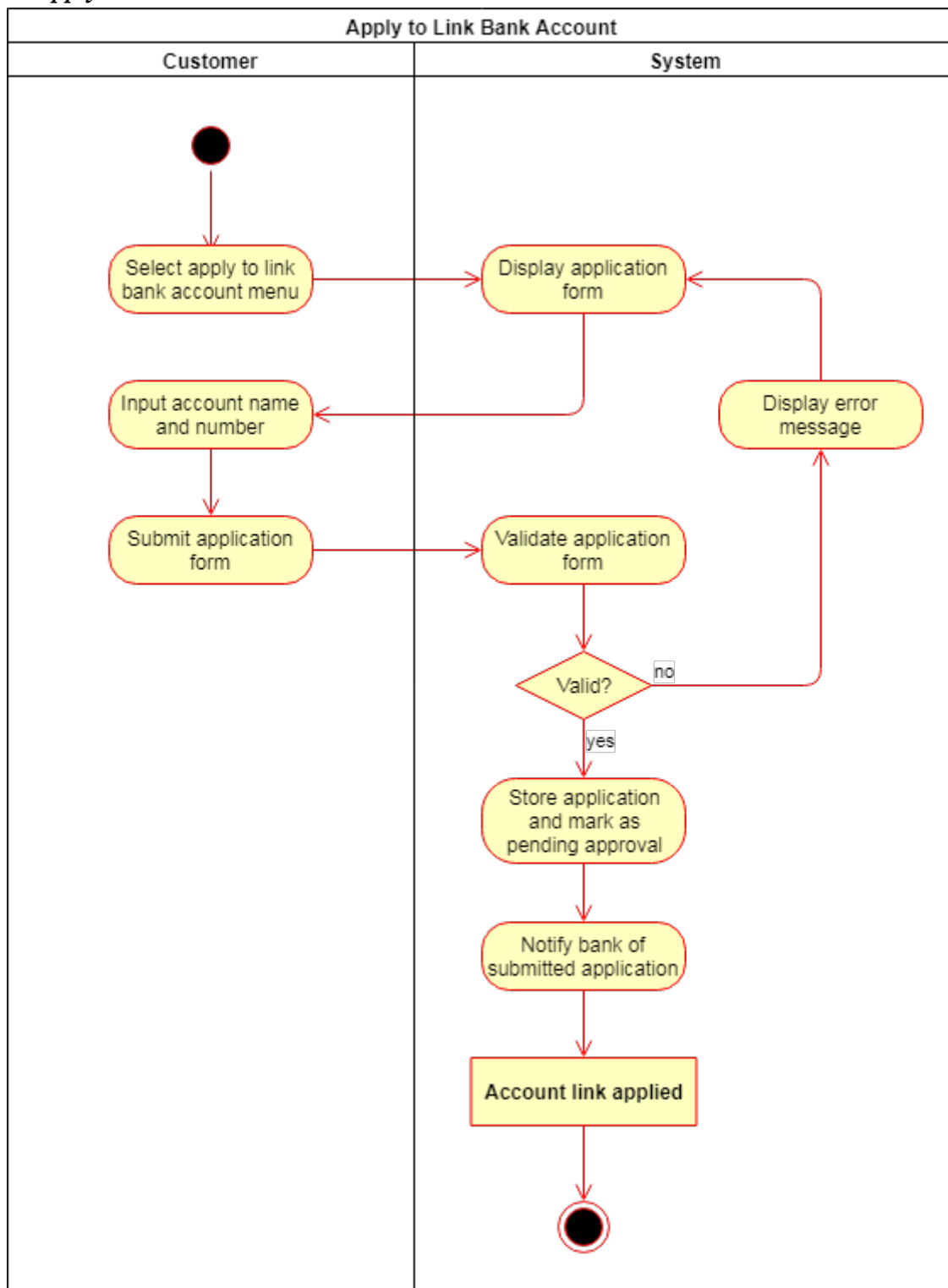
UC-1 Register Customer's Account



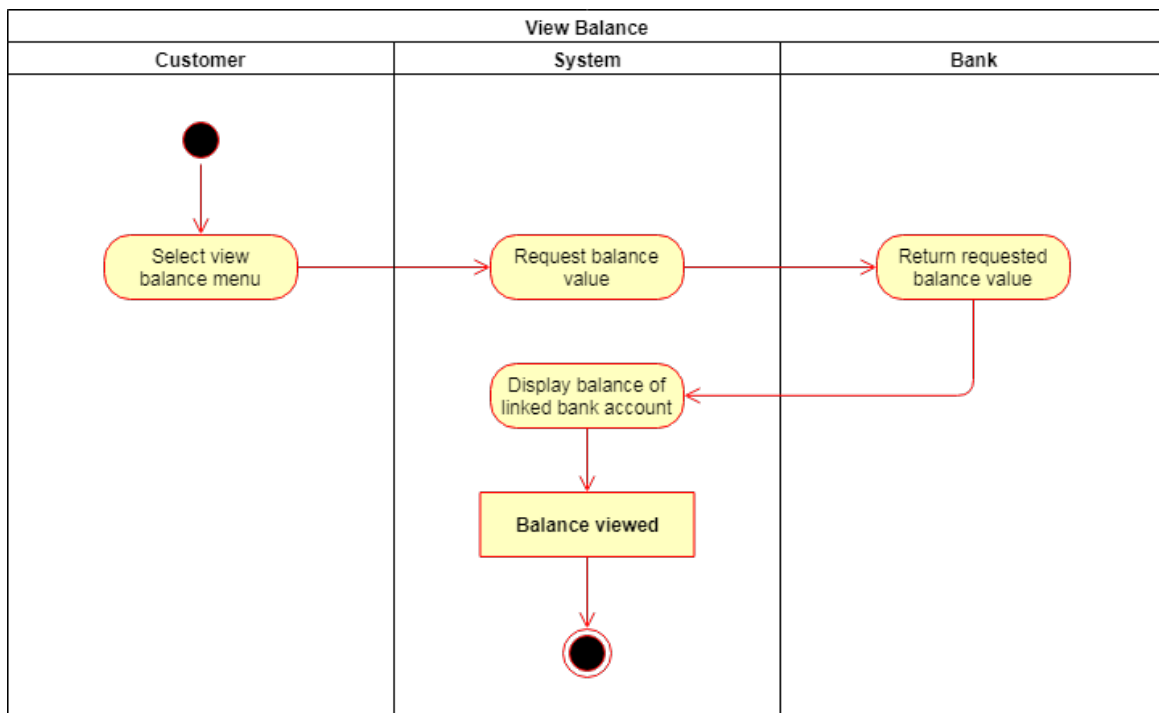
UC-2 Log in into Customer's Account



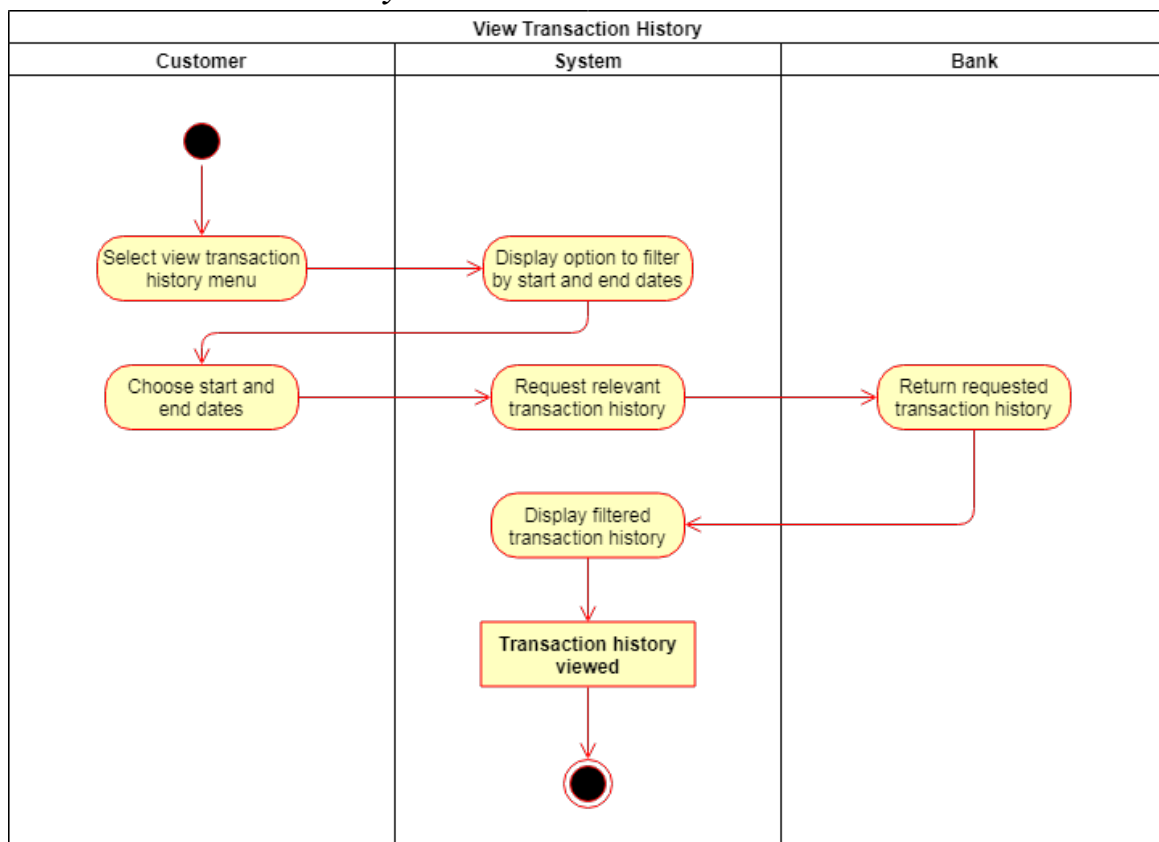
UC-3 Apply to Link Bank Account



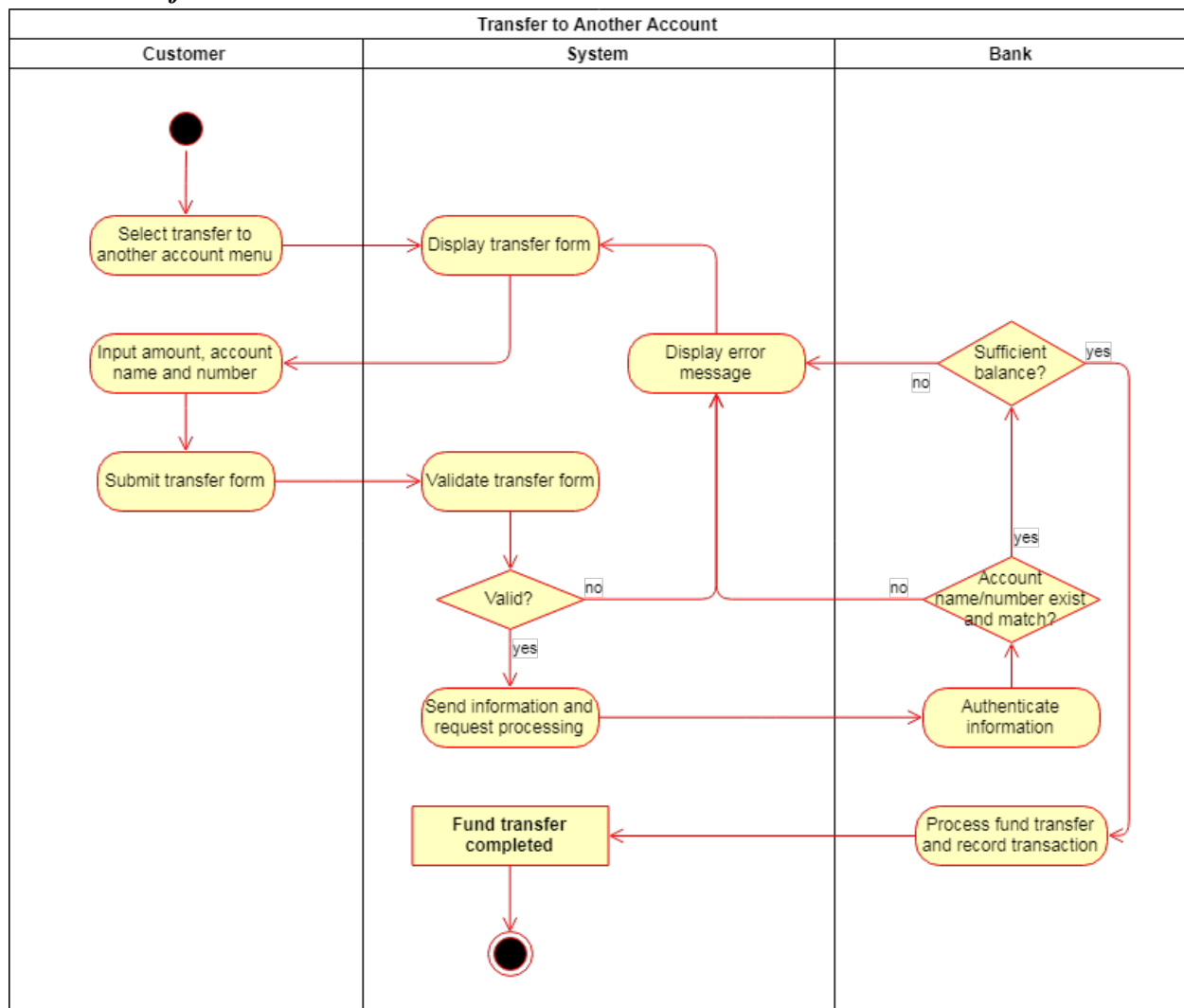
UC-4 View Balance



UC-5 View Transaction History

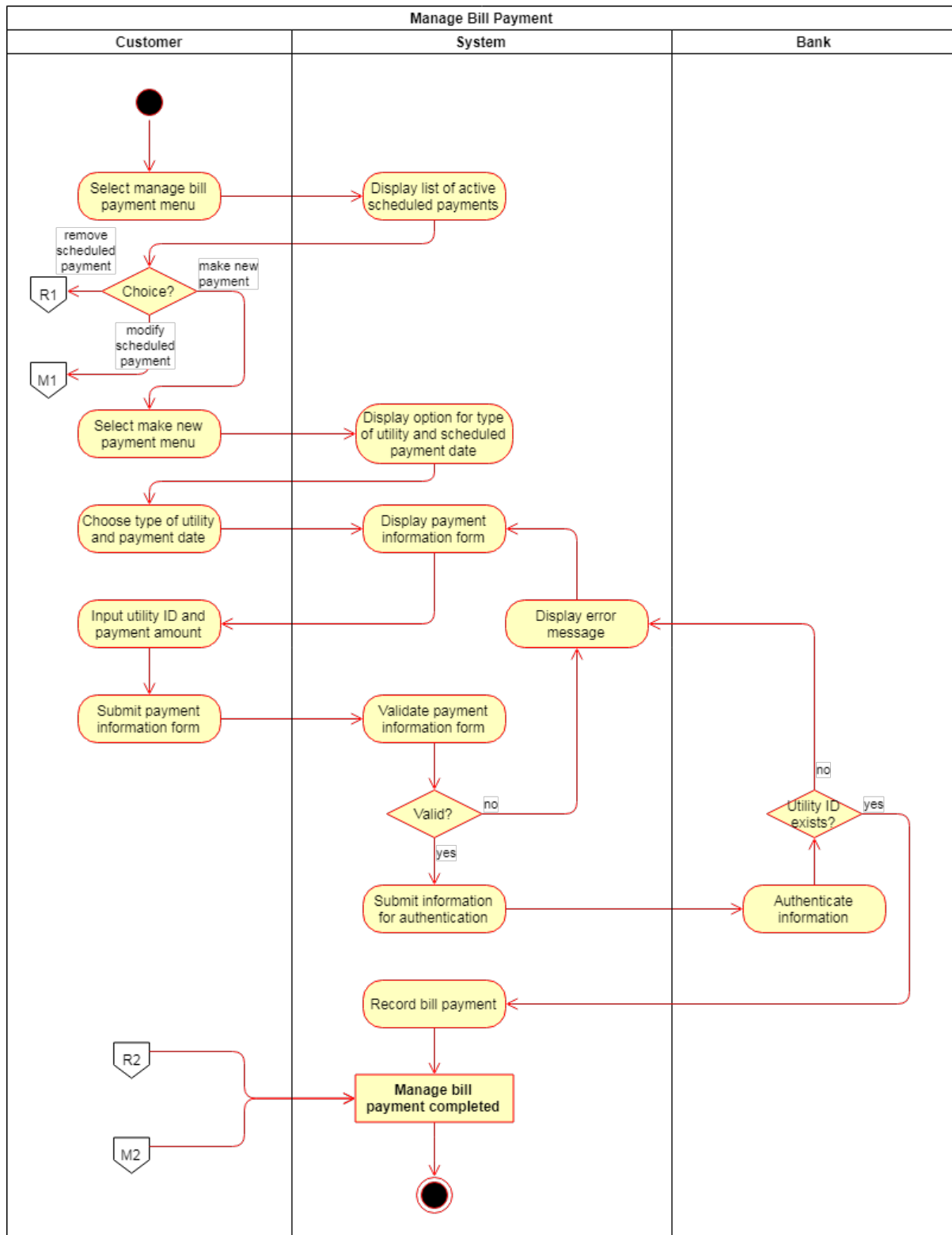


UC-6 Transfer to Another Account

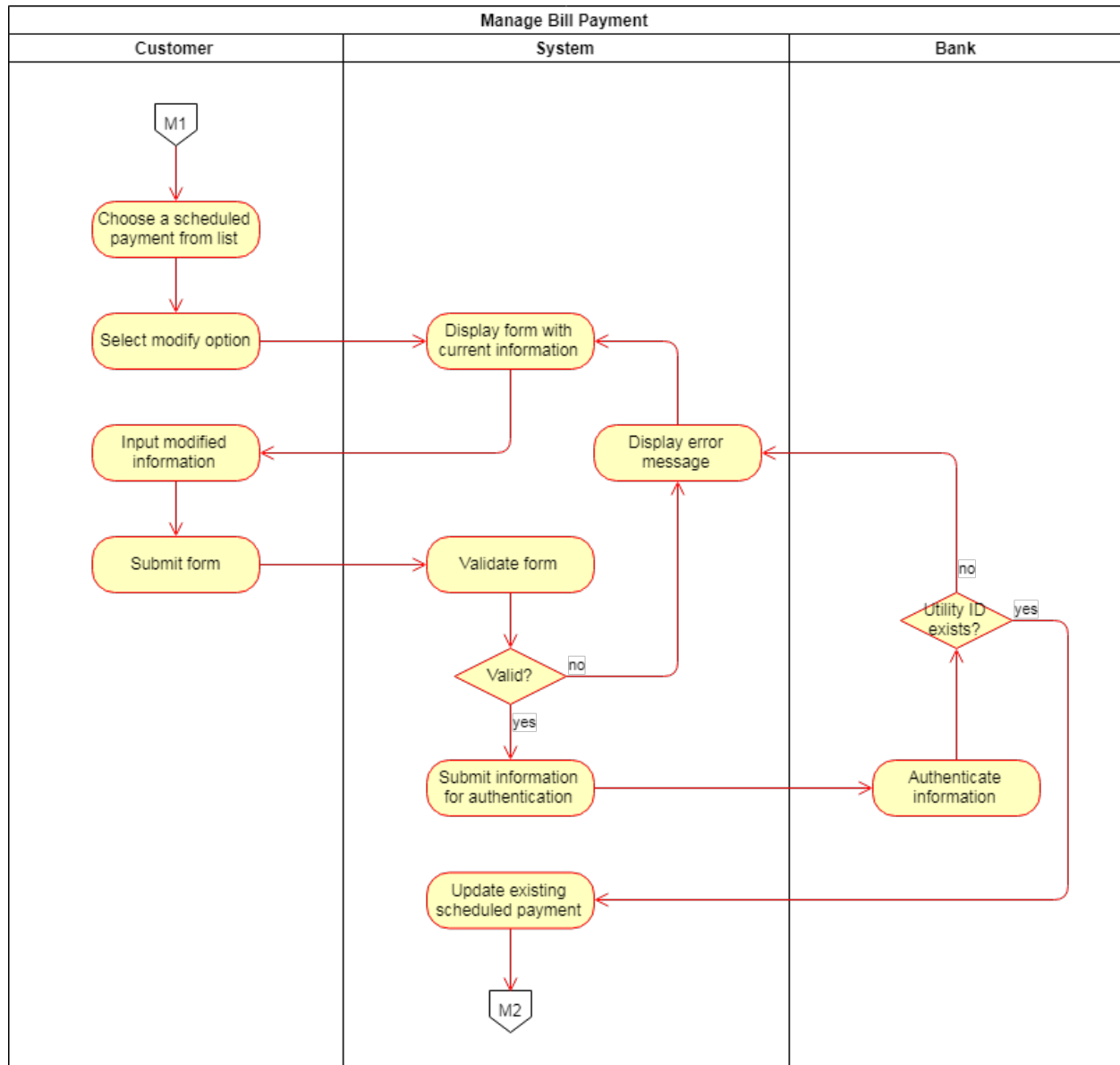


UC-7 Manage Bill Payment

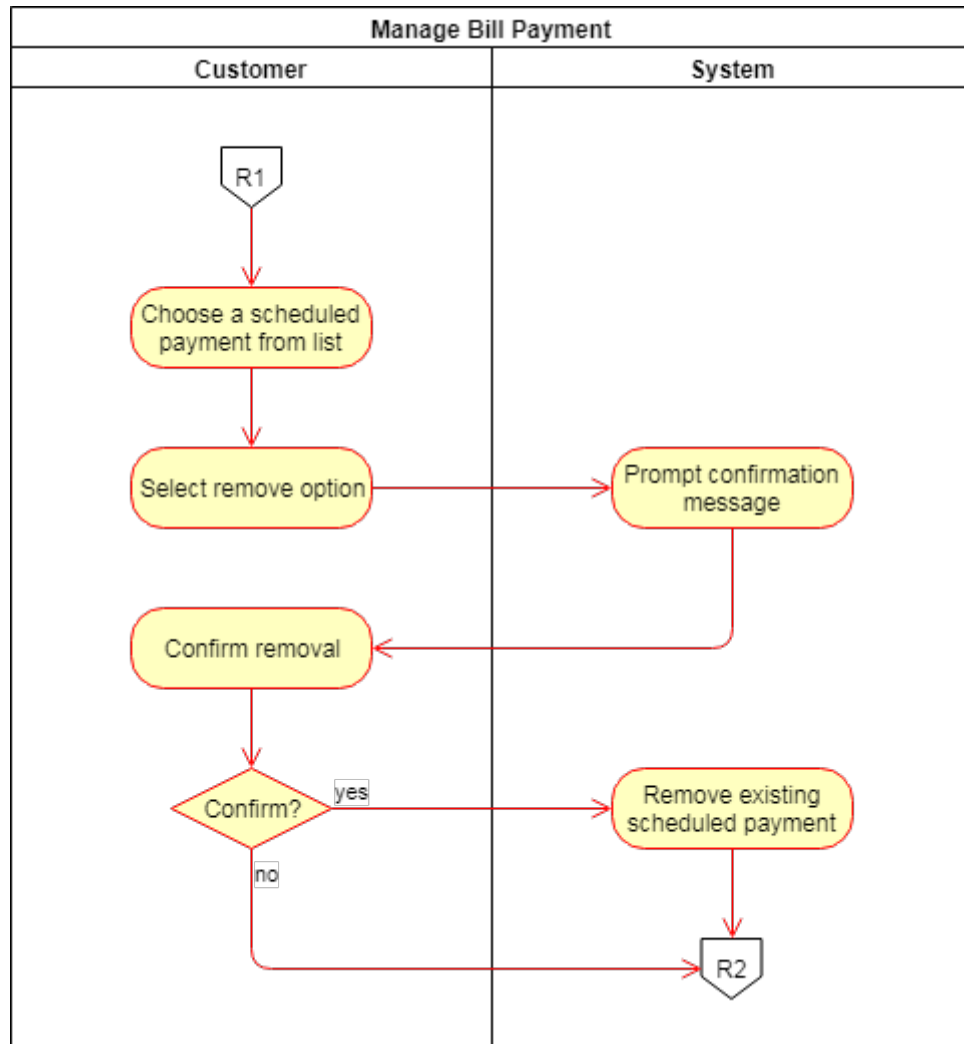
(A) Make New Payment



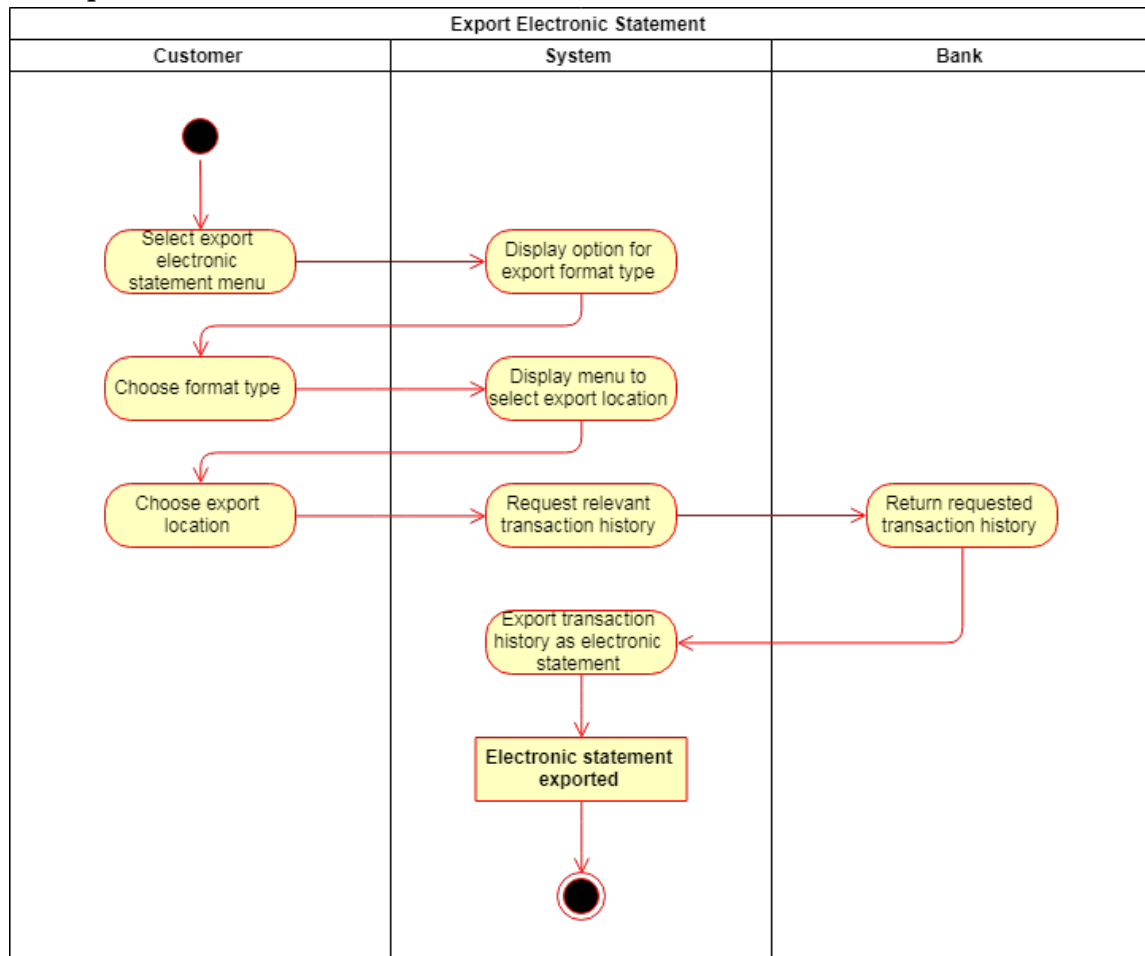
(B) Modify Scheduled Payment



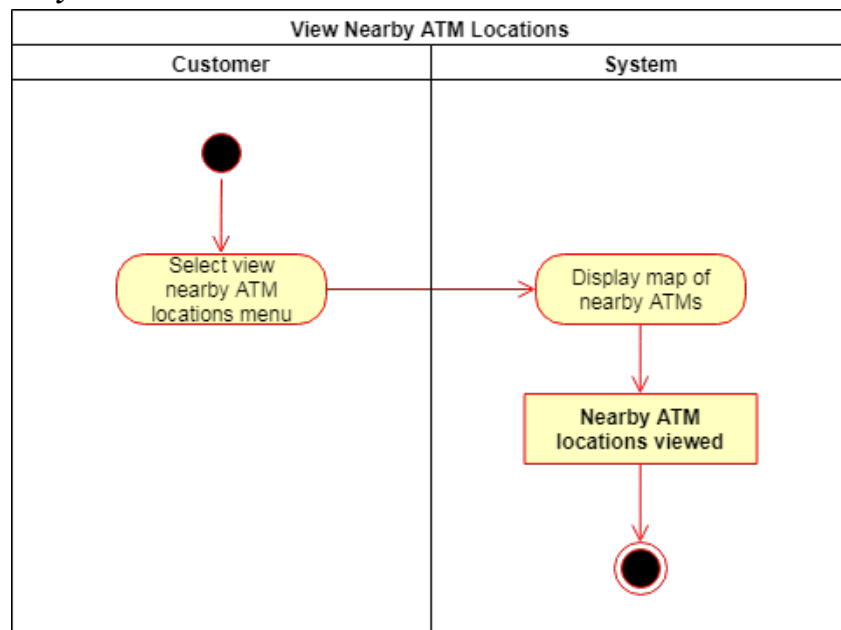
(C) Remove Scheduled Payment



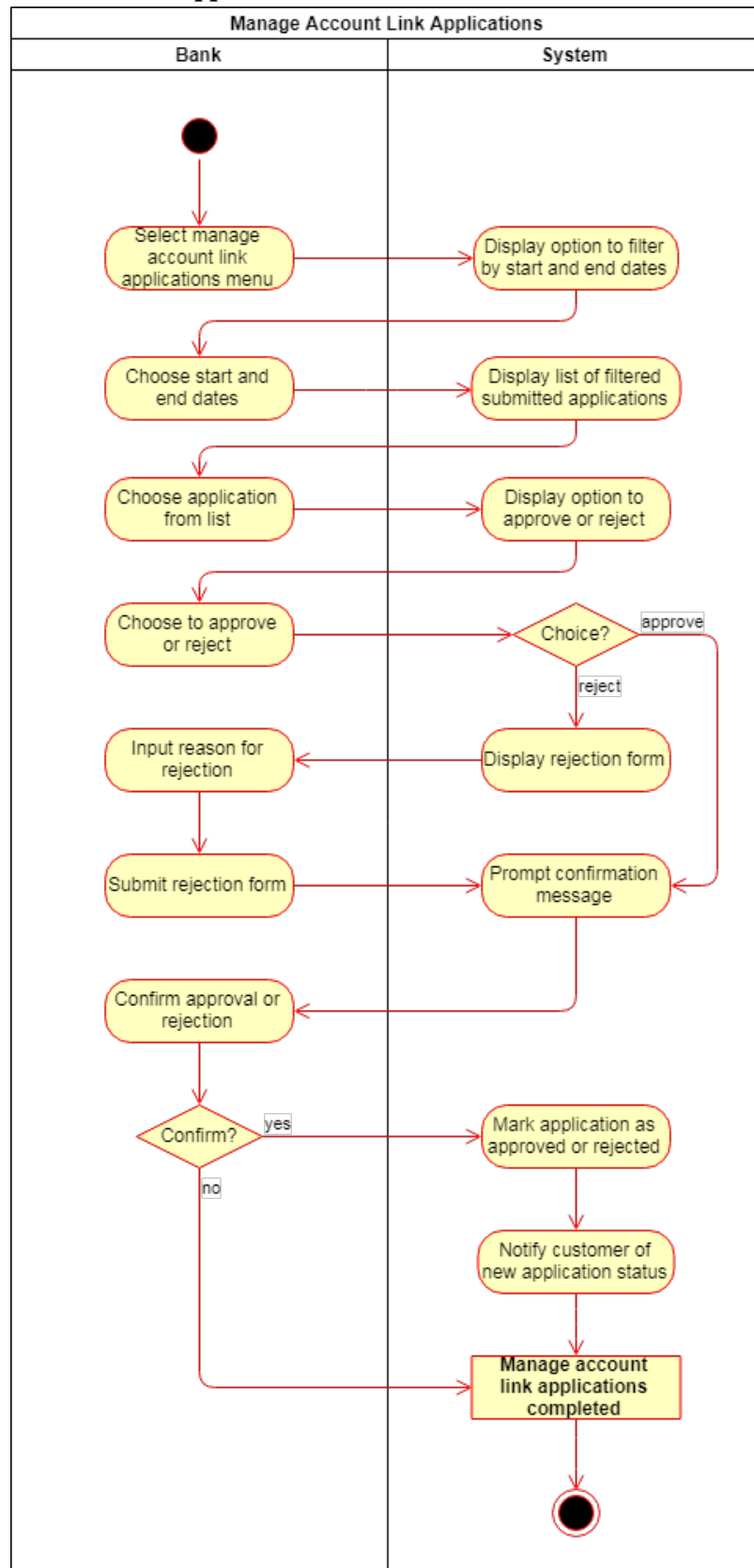
UC-8 Export Electronic Statement



UC-9 View Nearby ATM Locations

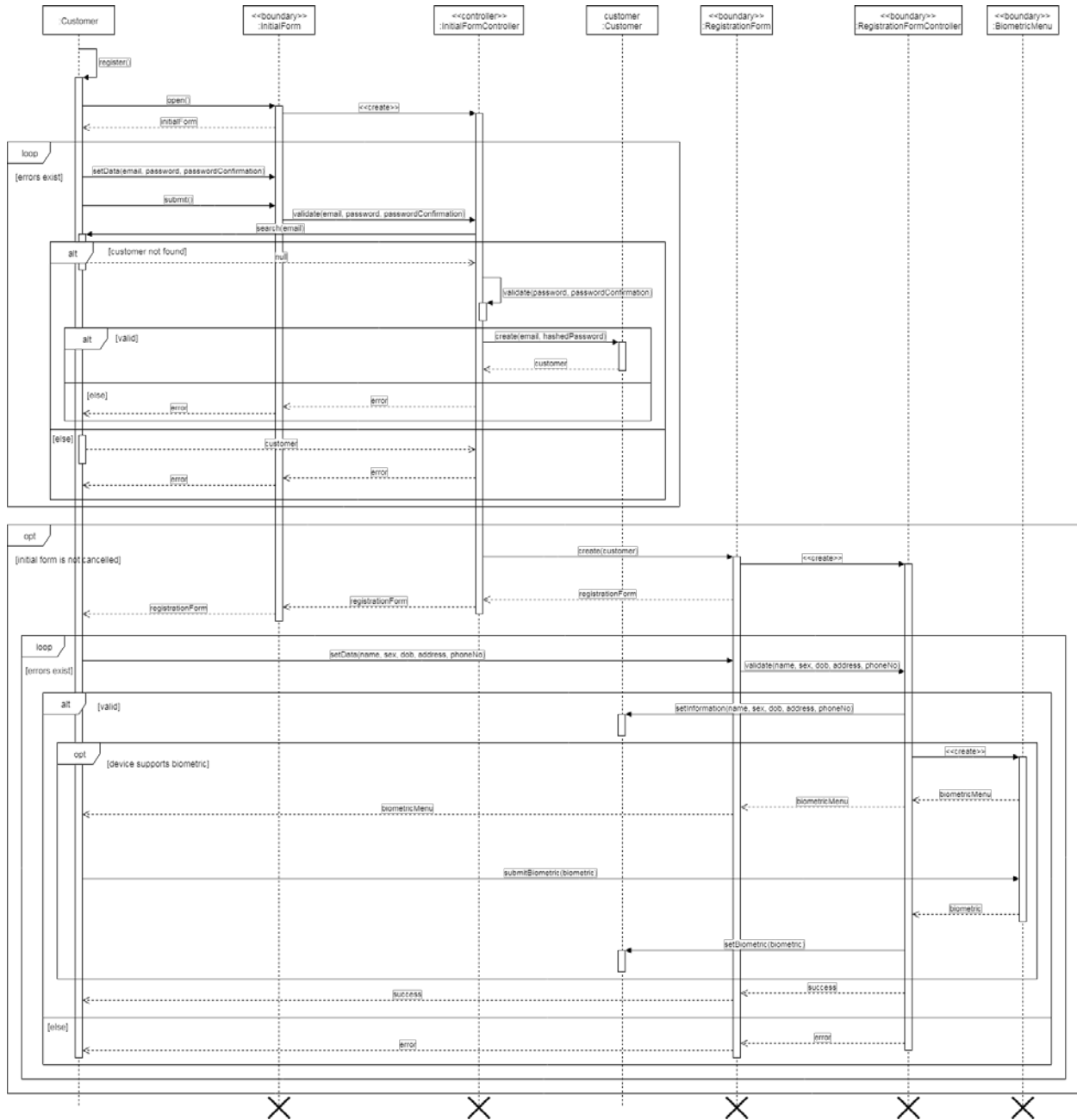


UC-10 Manage Account Link Applications



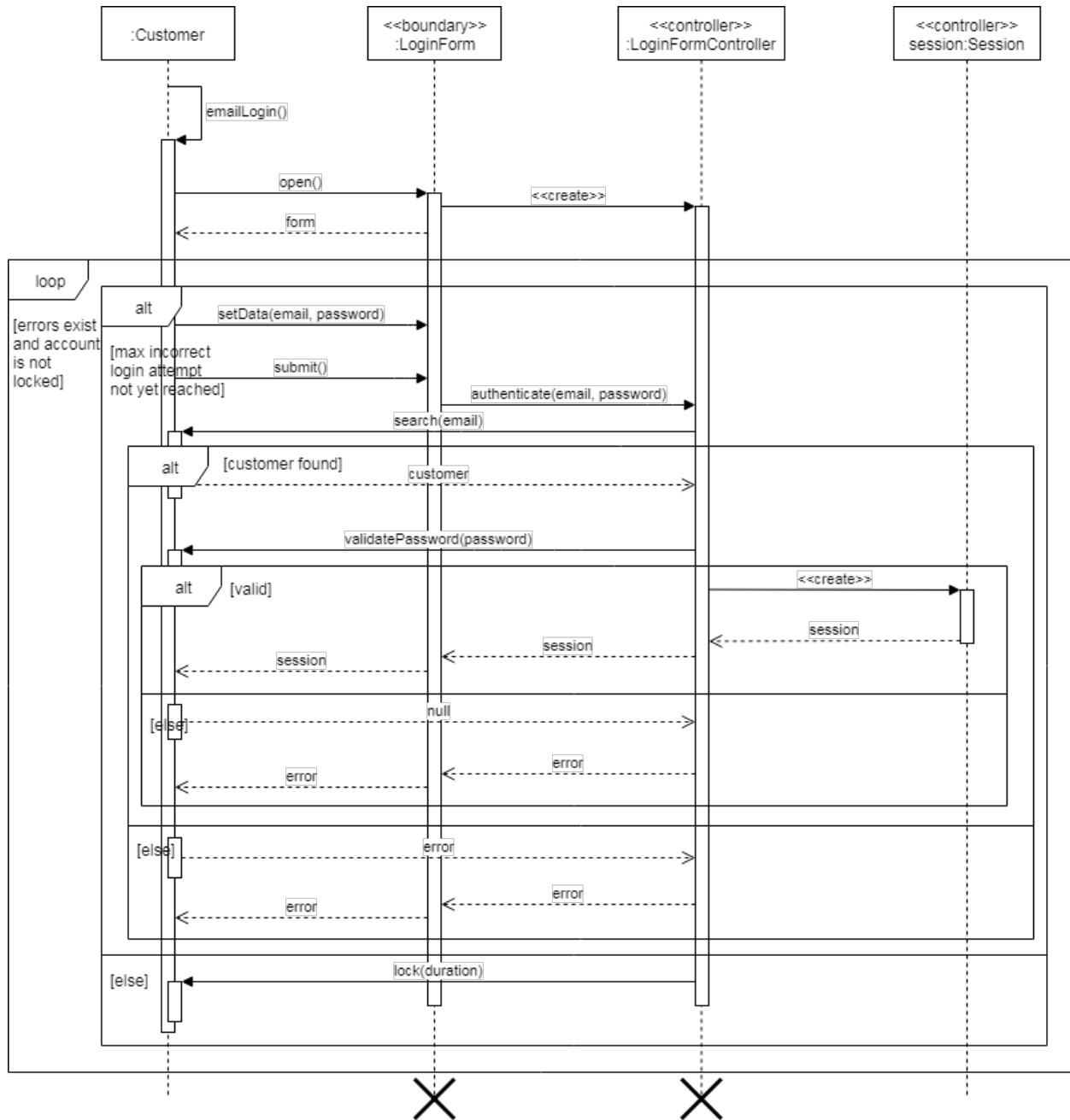
4.6 Sequence Diagram

UC-1 Register Customer's Account

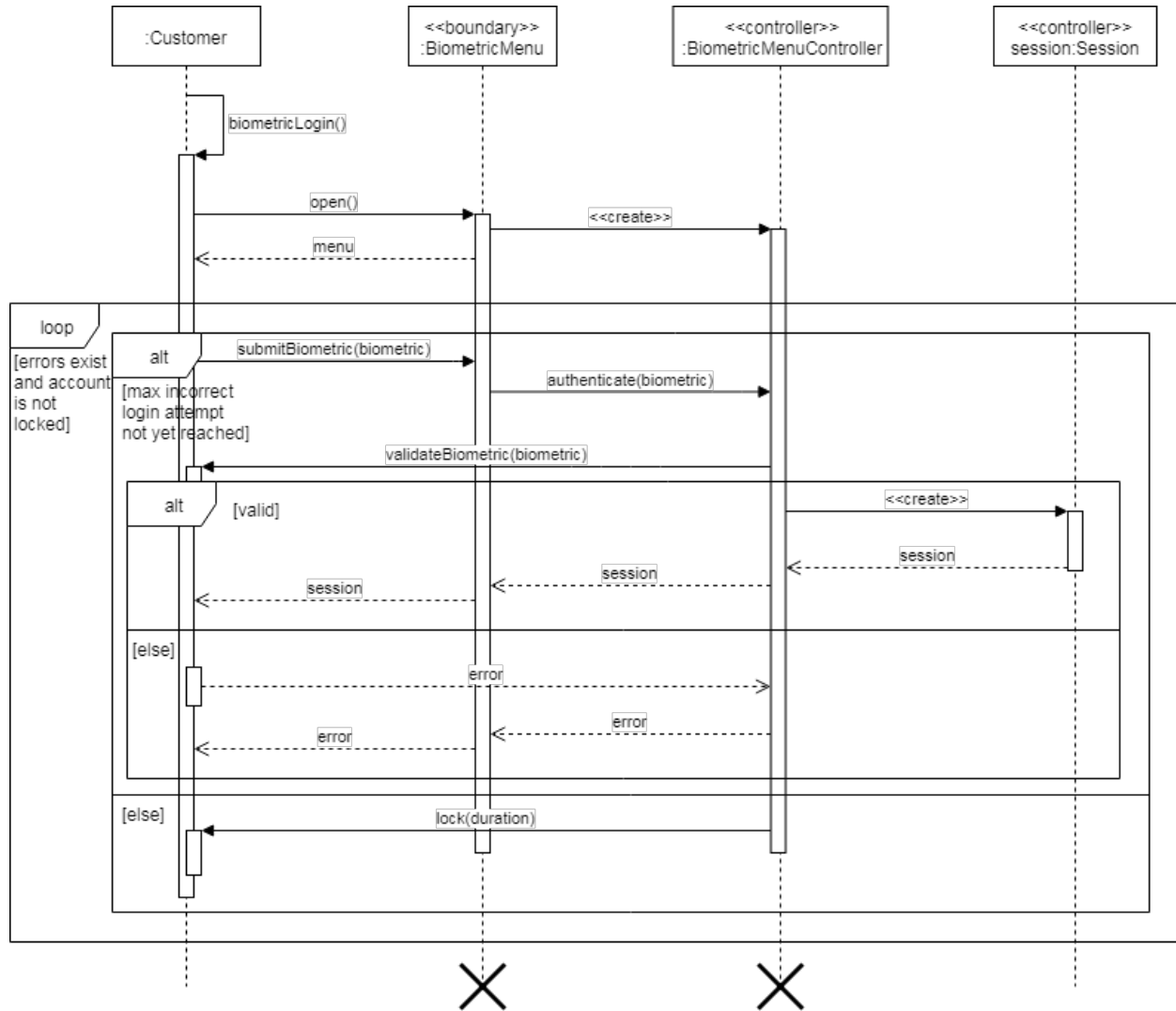


UC-2 Log in into Customer's Account

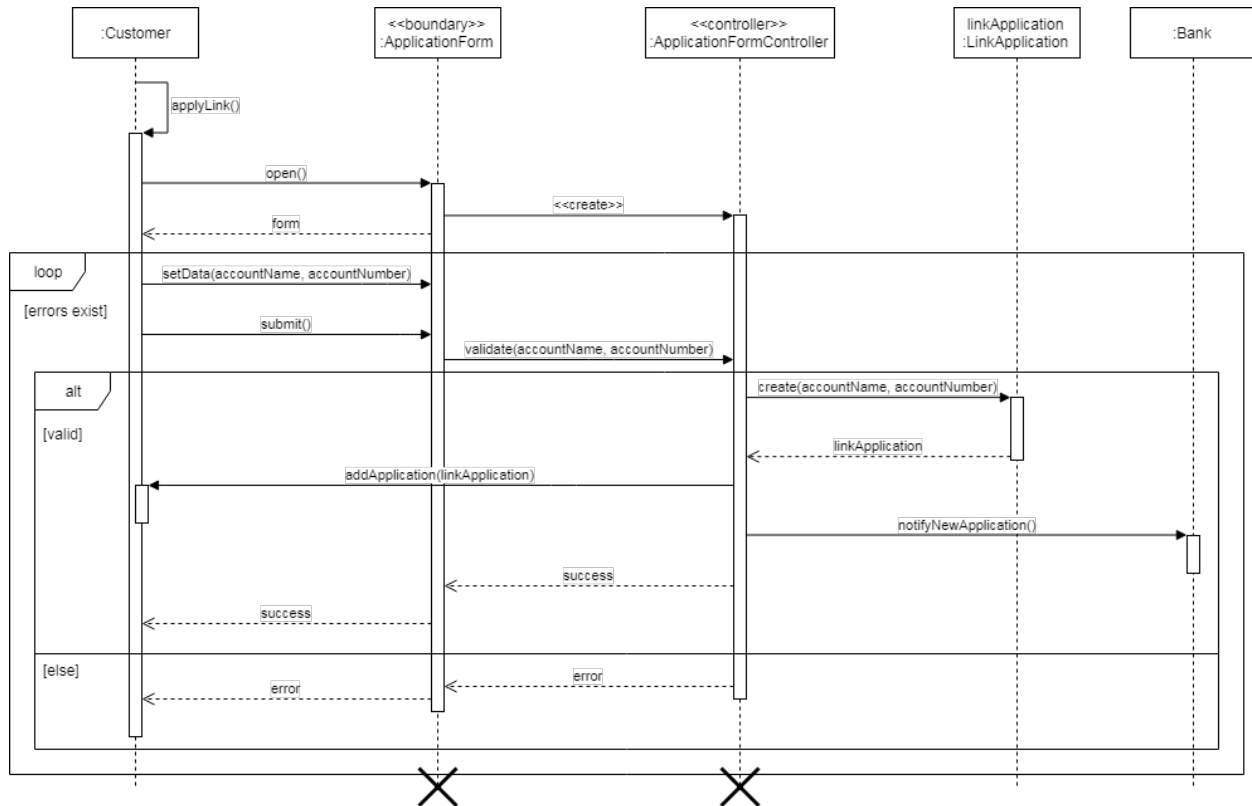
(A) E-mail Login



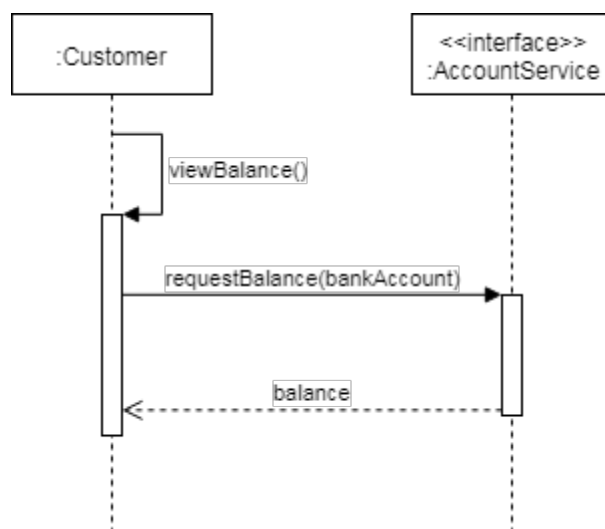
(B) Biometric Login



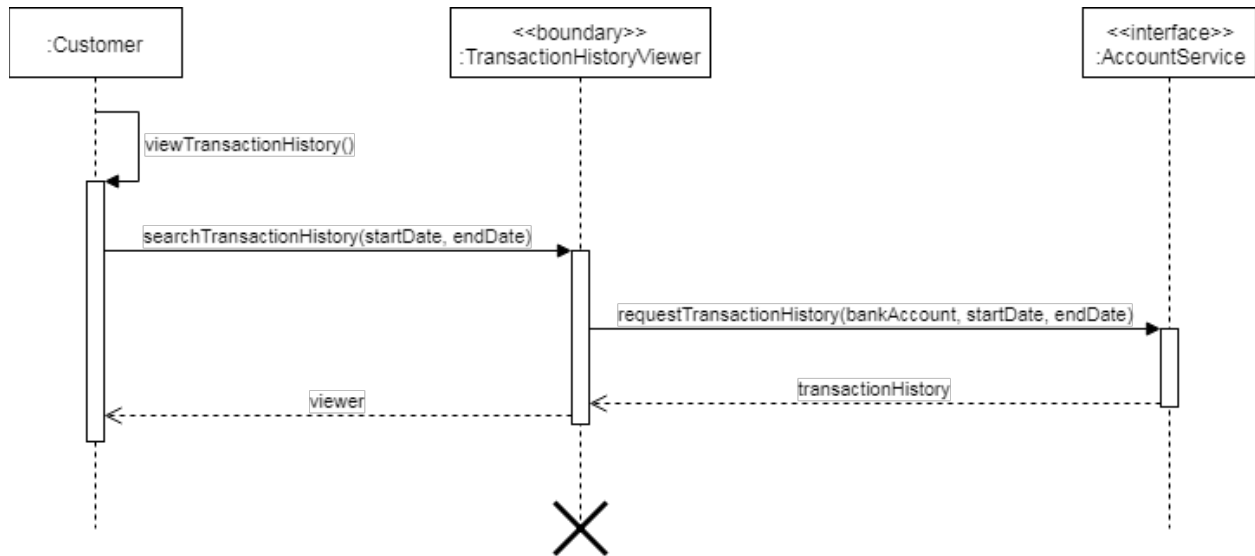
UC-3 Apply to Link Bank Account



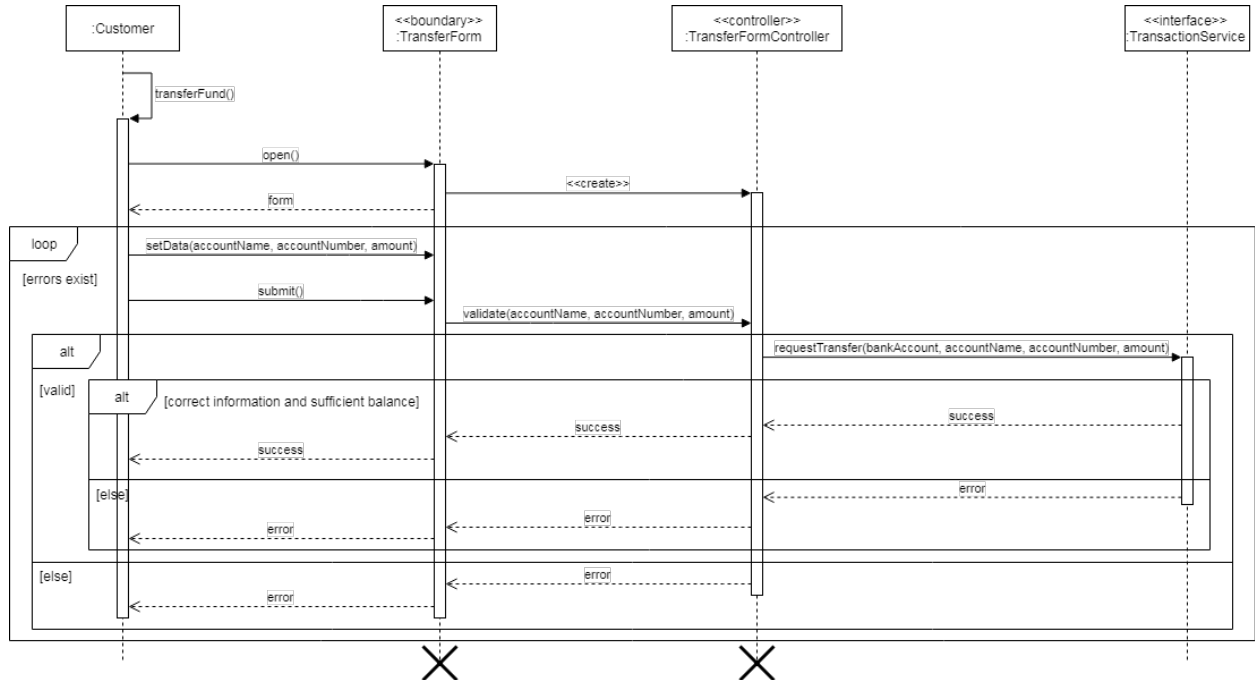
UC-4 View Balance



UC-5 View Transaction History

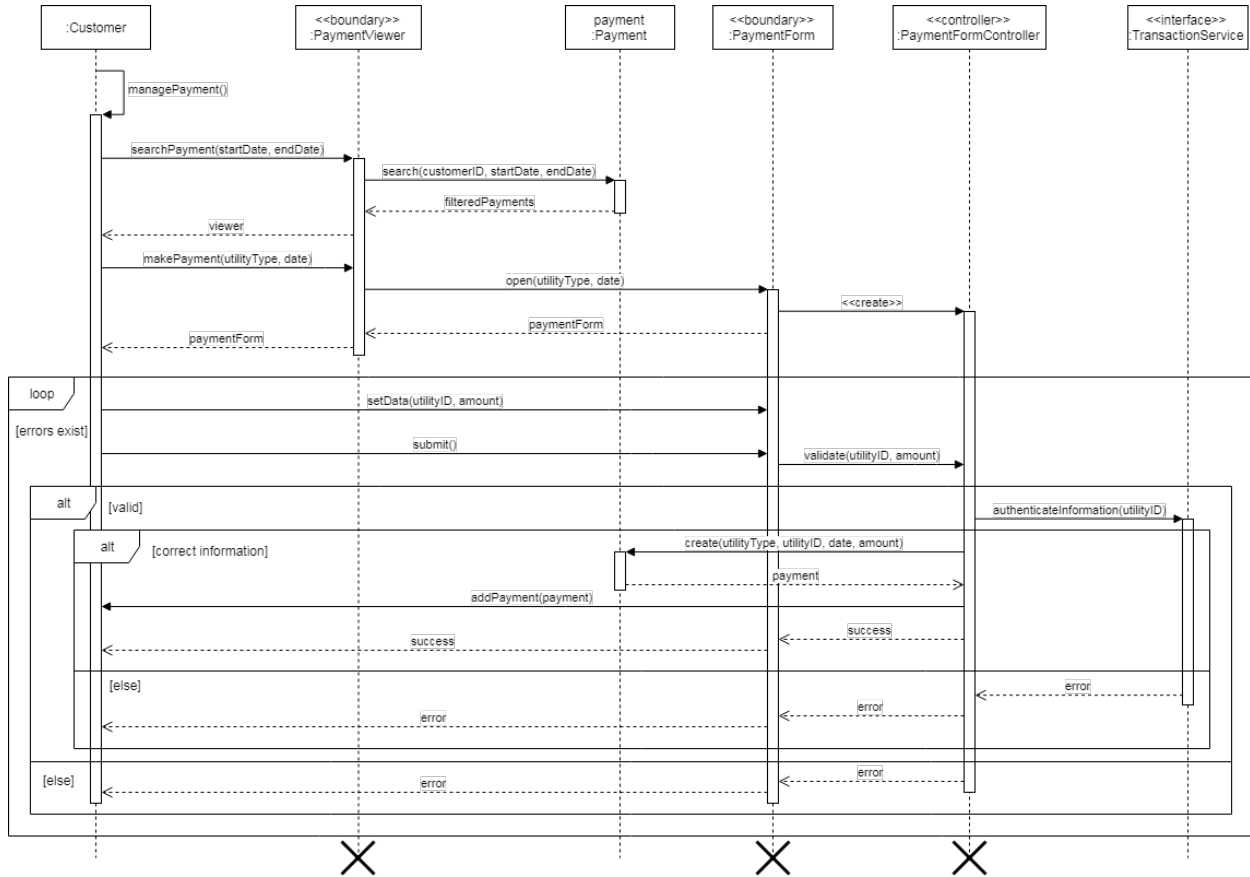


UC-6 Transfer to Another Account

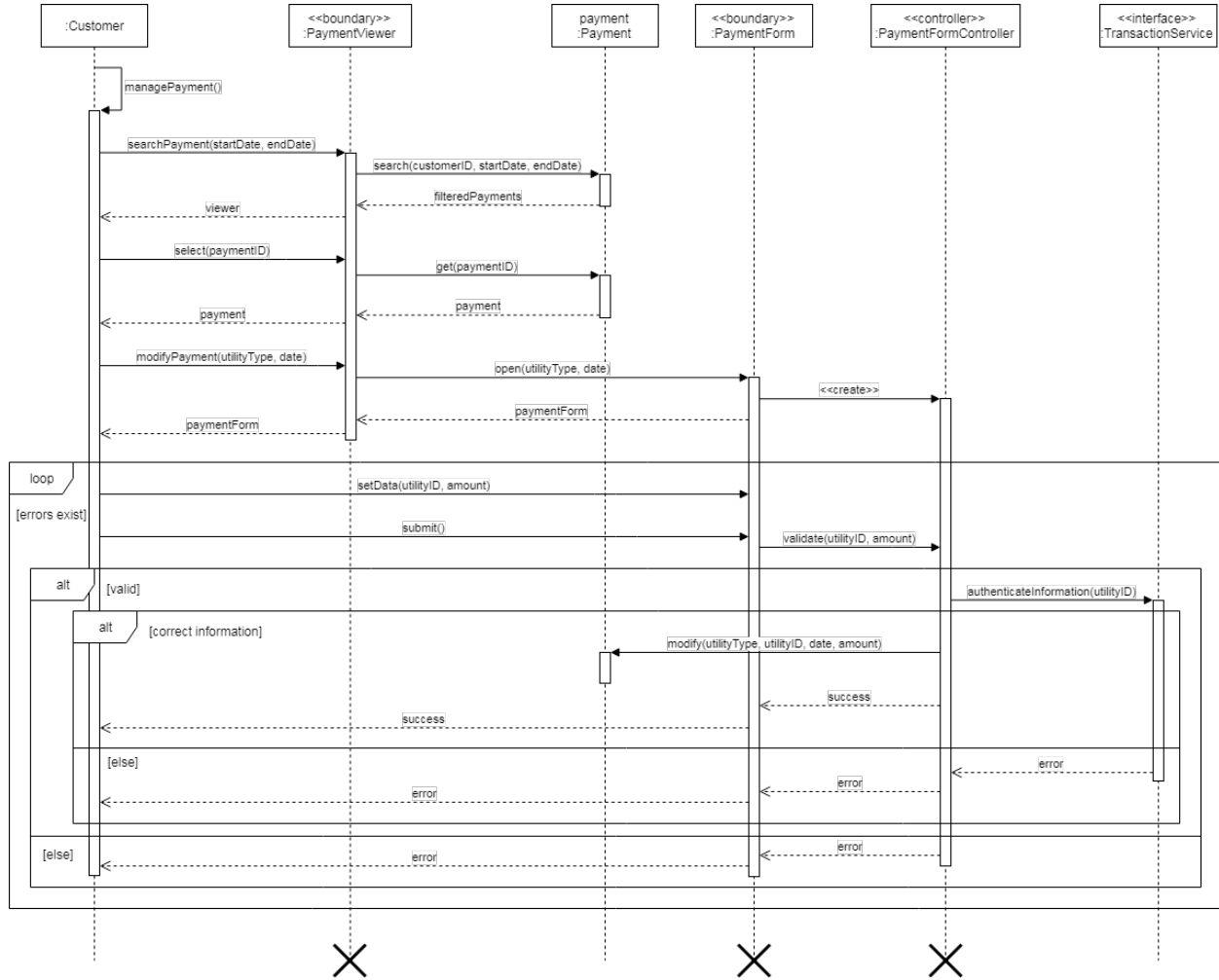


UC-7 Manage Bill Payment

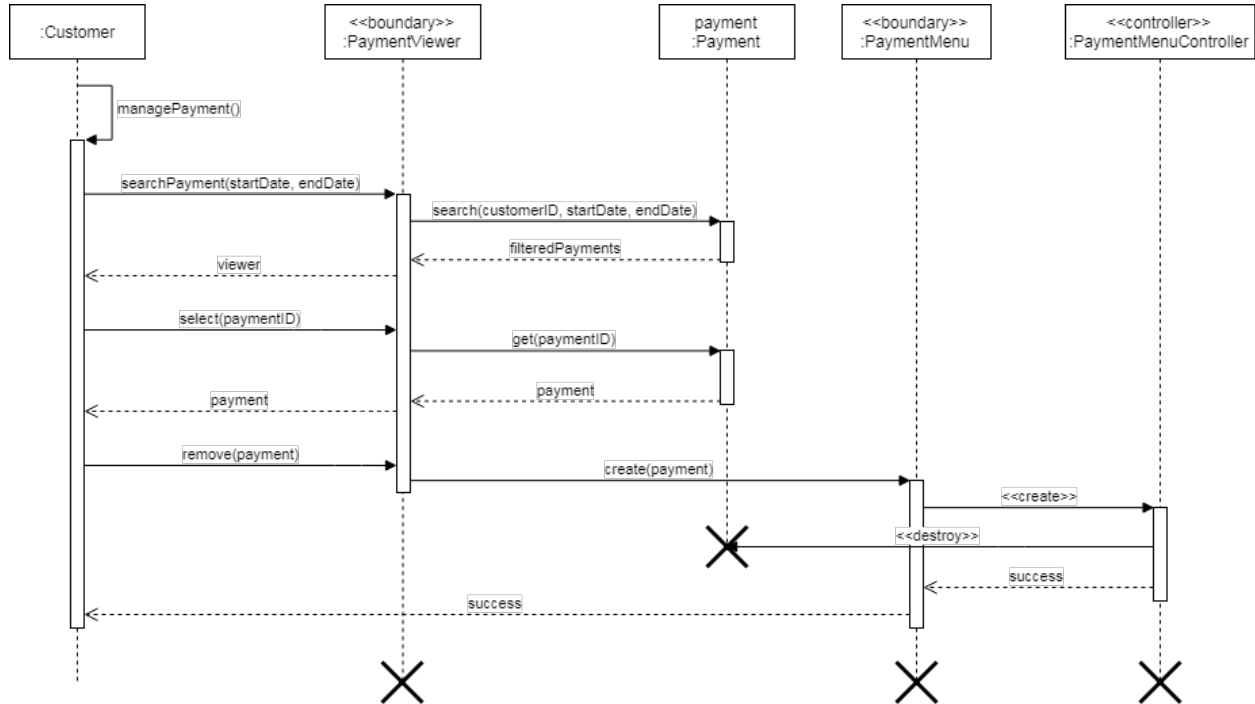
(A) Make New Payment



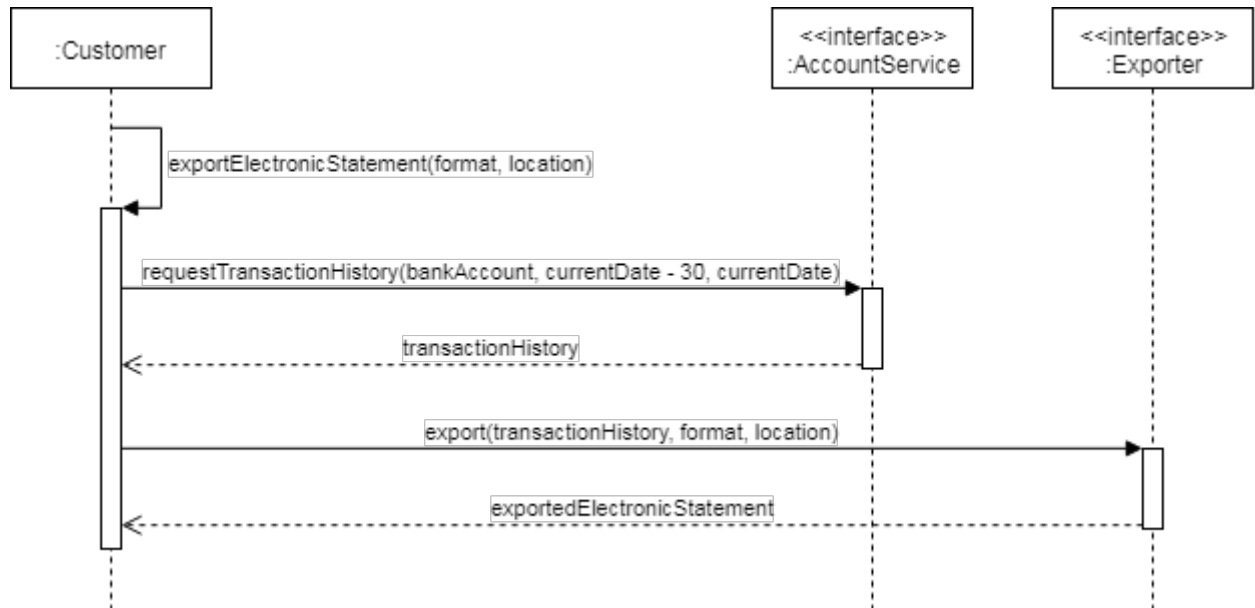
(B) Modify Scheduled Payment



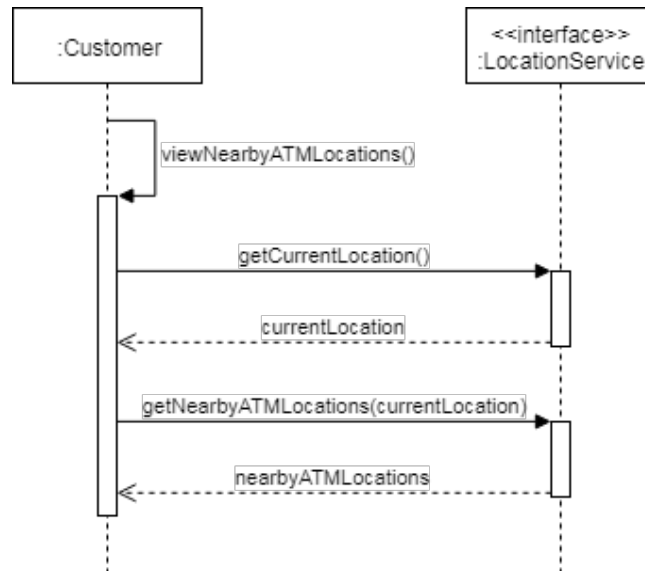
(C) Remove Scheduled Payment



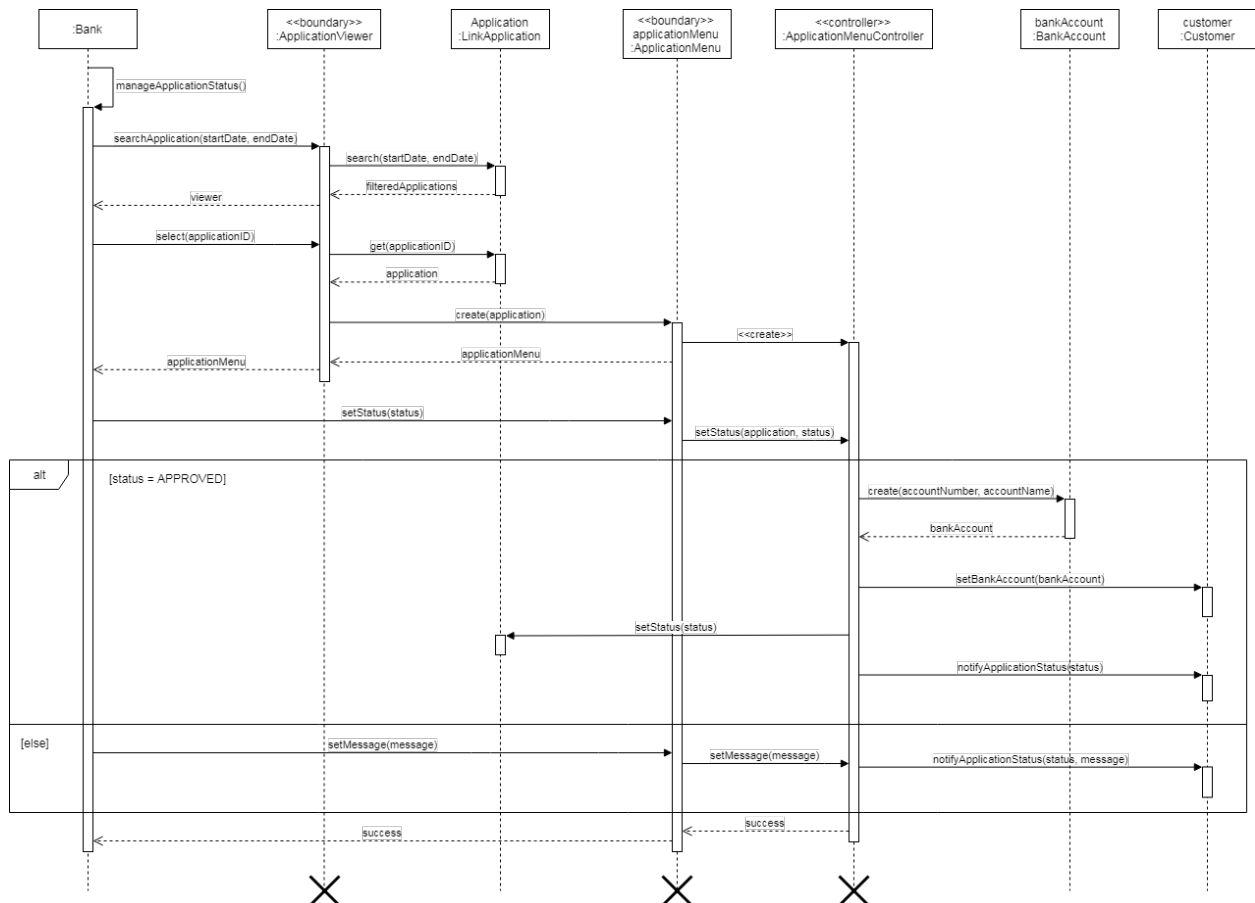
UC-8 Export Electronic Statement



UC-9 View Nearby ATM Locations



UC-10 Manage Account Link Applications



4.7 Use Case Test Plans

UC-1 Register Customer's Account

Test case ID	TC-1		
Test case name	Register new customer with biometric-supported device		
Preconditions	Customer is not registered		
Action	Expected Results	Test Data	
1. Select account registration menu	System displays blank registration form with e-mail address, password and password confirmation fields.	-	
2. Fill the corresponding fields and press submit	System searches for the submitted e-mail address and finds no existing account.	E-mail address = <i>tester1@mail.com</i>	
	System compares submitted password fields and confirms that they are equal.	Password = <i>password123</i>	
	System displays blank registration form to request personal information.	Password confirmation = <i>password123</i>	
3. Enter personal information in respective fields and press submit	System validates the submitted information and finds them valid. System stores the customer's information and requests for biometric ID.	Name = <i>John Doe</i>	
		[Choose sex as male]	
		DOB = <i>01/01/1990</i>	
4. Input biometric ID and proceed	System stores the inputted biometric ID and links it to the customer's account	Address = <i>123 Street, Some Town, Some State, Indonesia</i>	
		Phone = <i>+628123456789</i>	
		Biometric = [fingerprint]	

Test case ID	TC-2		
Test case name	Register existing customer		
Preconditions	Customer is not registered		
Action	Expected Results	Test Data	
1. Select account registration	System displays blank	-	

menu	registration form with e-mail address, password and password confirmation fields.	
2. Fill the corresponding fields and press submit	<p>System searches for the submitted e-mail address and finds an existing account.</p> <p>System displays an error message about an existing account with the same e-mail address.</p>	<p>E-mail address = <i>tester1@mail.com</i></p> <p>Password = <i>password123</i></p> <p>Password confirmation = <i>password123</i></p>

Test case ID	TC-3	
Test case name	Register new customer with invalid password	
Preconditions	Customer is not registered	
Action	Expected Results	Test Data
1. Select account registration menu	System displays blank registration form with e-mail address, password and password confirmation fields.	-
2. Fill the corresponding fields and press submit	<p>System searches for the submitted e-mail address and finds no existing account.</p> <p>System compares submitted password fields and detects that they are mismatched.</p> <p>System displays an error message about the mismatched password.</p>	<p>E-mail address = <i>tester2@mail.com</i></p> <p>Password = <i>password123</i></p> <p>Password confirmation = <i>password12</i></p>
3. Enter personal information in respective fields and press submit	<p>System validates the submitted information and finds them valid.</p> <p>System stores the customer's information and requests for biometric ID.</p>	<p>Name = <i>John Doe</i></p> <p>[Choose sex as male]</p> <p>DOB = <i>01/01/1990</i></p> <p>Address = <i>123 Street, Some Town, Some State, Indonesia</i></p> <p>Phone =</p>

		+628123456789
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Test case ID	TC-4		
Test case name	Register new customer with invalid form entry		
Preconditions	Customer is not registered		
Action	Expected Results	Test Data	
1. Select account registration menu	System displays blank registration form with e-mail address, password and password confirmation fields.	-	
2. Fill the corresponding fields and press submit	System searches for the submitted e-mail address and finds no existing account.	E-mail address = <i>tester3@mail.com</i>	
	System compares submitted password fields and confirms that they are equal. System displays blank registration form to request personal information.	Password = <i>password123</i> Password confirmation = <i>password123</i>	
3. Enter personal information in respective fields and press submit	System validates the submitted information and finds some of them invalid or incomplete. System displays an error message and highlights the invalid or incomplete fields.	Name = [Empty] [Choose sex as male] DOB = <i>01/01/1000</i> Address = <i>123 Street</i> Phone = <i>abc</i>	

Test case ID	TC-5		
Test case name	Register new customer with biometric-unsupported device		
Preconditions	Customer is not registered		
Action	Expected Results	Test Data	
1. Select account registration menu	System displays blank registration form with fields for e-mail address, password and password confirmation.	-	
2. Fill the corresponding fields and press submit	System searches for the submitted e-mail address and finds no existing account.	E-mail address = <i>tester4@mail.com</i>	

	System compares submitted password fields and confirms that they are equal. System displays blank registration form to request personal information.	Password = <i>password123</i> Password confirmation = <i>password123</i>
3. Enter personal information in respective fields and press submit	System validates the submitted information and finds them valid. System stores the customer's information.	Name = <i>John Doe</i> [Choose sex as male] DOB = <i>01/01/1990</i> Address = <i>123 Street, Some Town, Some State, Indonesia</i> Phone = <i>+628123456789</i>

UC-2 Log in into Customer's Account

Test case ID	TC-6		
Test case name	E-mail login with correct information		
Preconditions	Customer has an account in the system		
Action	Expected Results	Test Data	
1. Select account login menu and choose e-mail login	System displays a blank login form with fields for e-mail and password.	-	
2. Fill the corresponding fields and press submit	System searches for the submitted e-mail address and finds an existing account. System compares the password with the stored associated password and confirms both are equal.	E-mail address = <i>tester1@mail.com</i> Password = <i>password123</i>	

Test case ID	TC-7		
Test case name	E-mail login with incorrect e-mail address		
Preconditions	Customer has an account in the system		
Action	Expected Results	Test Data	

1. Select account login menu and choose e-mail login	System displays a blank login form with fields for e-mail and password.	-
2. Fill the corresponding fields and press submit	<p>System searches for the submitted e-mail address and does not find an existing account.</p> <p>System displays an error message about an existent account with the submitted e-mail address and increases the incorrect login attempt count.</p>	<p>E-mail address = <i>wrong@mail.com</i></p> <p>Password = <i>password123</i></p>

Test case ID	TC-8		
Test case name	E-mail login with incorrect password		
Preconditions	Customer has an account in the system		
Action	Expected Results	Test Data	
1. Select account login menu and choose e-mail login	System displays a blank login form with fields for e-mail and password.	-	
2. Fill the corresponding fields and press submit	<p>System searches for the submitted e-mail address and finds an existing account.</p> <p>System compares the password with the stored associated password and detects that they are mismatched.</p> <p>System displays an error message about the mismatched password and increases the incorrect login attempt count.</p>	<p>E-mail address = <i>tester1@mail.com</i></p> <p>Password = <i>wrong</i></p>	

Test case ID	TC-9		
Test case name	Biometric login with correct information		
Preconditions	Customer has an account in the system		
Action	Expected Results	Test Data	
1. Select account login menu and choose biometric login	System prompts for biometric information.	-	
2. Input biometric information	System searches for the	Biometric =	

	inputted biometric information in its database and identifies the account with the associated biometric information.	[fingerprint from a registered account]
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Test case ID	TC-10		
Test case name	Biometric login with incorrect information		
Preconditions	Customer has an account in the system		
Action	Expected Results	Test Data	
1. Select account login menu and choose biometric login	System prompts for biometric information.	-	
2. Input biometric information	System searches for the inputted biometric information in its database but does not find an account with the associated biometric information. System displays an error message about the incorrect biometric information and increases the incorrect login attempt count.	Biometric = [unrecognized fingerprint]	

UC-3 Apply to Link Bank Account

Test case ID	TC-11		
Test case name	Apply to link bank account with valid form entry		
Preconditions	Customer is logged in and has no linked bank account		
Action	Expected Results	Test Data	
1. Select apply to link bank account menu	System displays blank form with fields for account name and number.	-	
2. Fill the corresponding fields and press submit	System validates the submitted information and finds them valid. System stores the account link application, marks it as pending approval and notifies bank of the new application.	Account name = <i>John Doe</i> Account number = <i>123456789</i>	

Test case ID	TC-12		
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Test case name	Apply to link bank account with invalid form entry		
Preconditions	Customer is logged in and has no linked bank account		
Action	Expected Results	Test Data	
1. Select apply to link bank account menu	System displays blank form with fields for account name and number.	-	
2. Fill the corresponding fields and press submit	System validates the submitted information and finds some of them invalid or incomplete. System displays an error message and highlights the invalid or incomplete fields.	Account name = [Empty] Account number = <i>abc</i>	

UC-4 View Balance

Test case ID	TC-13		
Test case name	View balance		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select view balance menu	System requests balance value from the bank, which returns the requested value. System displays the balance of the linked bank account.	-	

UC-5 View Transaction History

Test case ID	TC-14		
Test case name	View transaction history		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select view transaction history menu	System displays option to filter by start and end dates.	-	
2. Choose the start and end dates	System requests the relevant transaction history from bank, which returns the requested information. System displays list of past transactions filtered by the chosen start and end dates.	[Choose 15/01/2019 as start date] [Choose 15/02/2019 as end date]	

UC-6 Transfer to Another Account

Test case ID	TC-15		
Test case name	Fund transfer with correct information and sufficient balance		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select transfer to another account menu	System displays blank form with fields for fund amount and receiver's account name and number.	-	
2. Fill the corresponding fields and press submit	System validates the submitted information and finds them valid. System sends the information to bank and requests processing of fund transfer. Bank confirms that the account name matches with the associated account number and that the balance is sufficient. Bank processes the fund transfer and records the transaction.	Fund amount = <i>100.000</i> Account name = <i>John Doe</i> Account number = <i>123456789</i>	

Test case ID	TC-16		
Test case name	Fund transfer with invalid form entry		
Preconditions	List of classes has been made		
Action	Expected Results	Test Data	
1. Select transfer to another account menu	System displays blank form with fields for fund amount and receiver's account name and number.	-	
2. Fill the corresponding fields and press submit	System validates the submitted information and finds some of them invalid or incomplete. System displays an error message and highlights the invalid or incomplete fields.	Fund amount = <i>abc</i> Account name = [Empty] Account number = <i>abc</i>	

Test case ID	TC-17		
Test case name	Fund transfer with incorrect information		

Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select transfer to another account menu	System displays blank form with fields for fund amount and receiver's account name and number.	-	
2. Fill the corresponding fields and press submit	<p>System validates the submitted information and finds them valid.</p> <p>System sends the information to bank and requests processing of fund transfer.</p> <p>Bank finds that the account name does not match with the associated account number.</p> <p>System displays an error message about the account name not matching the associated account number.</p>	<p>Fund amount = <i>100.000</i></p> <p>Account name = <i>Wrong</i></p> <p>Account number = <i>123456789</i></p>	

Test case ID	TC-18		
Test case name	Fund transfer with insufficient balance		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select transfer to another account menu	System displays blank form with fields for fund amount and receiver's account name and number.	-	
2. Fill the corresponding fields and press submit	<p>System validates the submitted information and finds them valid.</p> <p>System sends the information to bank and requests processing of fund transfer.</p> <p>Bank confirms that the account name matches with the associated account number but finds that the balance is insufficient.</p>	<p>Fund amount = <i>1.000.000.000</i></p> <p>Account name = <i>John Doe</i></p> <p>Account number = <i>123456789</i></p>	

	System displays an error message about the insufficient balance to fund the transfer.	
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UC-7 Manage Bill Payment

Test case ID	TC-19	
Test case name	Make new payment with correct information	
Preconditions	Customer is logged in and has an approved linked bank account	
Action	Expected Results	Test Data
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-
2. Select make new payment menu	System displays option to select scheduled payment date and utility type.	-
3. Choose scheduled date and type of utility	System displays a blank form with fields for utility ID and payment amount.	[Choose 15/12/2020 as date] [Choose electricity as utility type]
4. Fill the corresponding fields and press submit.	System validates the submitted information and finds them valid. System submits the information to bank, which confirms that the utility ID exists. System records the bill payment.	Utility ID = 123456789 Amount = 100.000

Test case ID	TC-20	
Test case name	Make new payment with invalid form entry	
Preconditions	Customer is logged in and has an approved linked bank account	
Action	Expected Results	Test Data
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-
2. Select make new payment menu	System displays option to select scheduled payment date and utility type.	-
3. Choose scheduled date and type of utility	System displays a blank form with fields for utility ID and payment amount.	[Choose 15/12/2020 as date] [Choose electricity

		as utility type]
4. Fill the corresponding fields and press submit.	<p>System validates the submitted information and finds some of them invalid or incomplete.</p> <p>System displays an error message and highlights the invalid or incomplete fields.</p>	<p>Utility ID = <i>abc</i></p> <p>Amount = <i>abc</i></p>

Test case ID	TC-21		
Test case name	Make new payment with incorrect utility ID		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-	
2. Select make new payment menu	System displays option to select scheduled payment date and utility type.	-	
3. Choose scheduled date and type of utility	System displays a blank form with fields for utility ID and payment amount.	<p>[Choose 15/12/2020 as date]</p> <p>[Choose electricity as utility type]</p>	
4. Fill the corresponding fields and press submit.	<p>System validates the submitted information and finds them valid.</p> <p>System submits the information to bank. Bank finds that the utility ID is inexistent.</p> <p>System displays an error message about the inexistent utility ID.</p>	<p>Utility ID = <i>123</i></p> <p>Amount = <i>100.000</i></p>	

Test case ID	TC-22		
Test case name	Modify scheduled payment with correct information		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-	

2. Choose payment from list and select modify option	System displays a form filled with current information.	-
3. Fill form with modified information and press submit.	System validates the submitted information and finds them valid. System submits the information to bank, which confirms that the utility ID exists. System updates the existing bill payment.	[Choose 15/11/2020 as date] [Choose water as utility type] Utility ID = 987654321 Amount = 200.000

Test case ID	TC-23		
Test case name	Modify scheduled payment with invalid form entry		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-	
2. Choose payment from list and select modify option	System displays a form filled with current information.	-	
3. Fill form with modified information and press submit.	System validates the submitted information and finds some of them invalid or incomplete. System displays an error message and highlights the invalid or incomplete fields.	[Choose 15/11/2020 as date] [Choose water as utility type] Utility ID = <i>abc</i> Amount = <i>abc</i>	

Test case ID	TC-24		
Test case name	Modify scheduled payment with incorrect utility ID		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-	
2. Choose payment from list and select modify option	System displays a form filled with current information.	-	
3. Fill form with modified information and press submit.	System validates the submitted information and finds them valid.	[Choose 15/11/2020 as date]	

	System submits the information to bank. Bank finds that the utility ID is inexistent.	[Choose water as utility type] Utility ID = 123
	System displays an error message about the inexistent utility ID.	Amount = 200.000

Test case ID	TC-25		
Test case name	Remove scheduled payment		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-	
2. Choose payment from list and select remove option	System prompts a confirmation message.	-	
3. Confirm removal	System removes the existing scheduled payment.	-	

Test case ID	TC-26		
Test case name	Cancel removing scheduled payment		
Preconditions	Customer is logged in and has an approved linked bank account		
Action	Expected Results	Test Data	
1. Select manage scheduled payment menu	System displays a list of active scheduled bill payments.	-	
2. Choose payment from list and select remove option	System prompts a confirmation message.	-	
3. Cancel removal	System ends the process.	-	

UC-8 Export Electronic Statement

Test case ID	TC-27		
Test case name	Export electronic statement		
Preconditions	Customer is logged in and has an approved linked bank account System has file writing permissions on the device		
Action	Expected Results	Test Data	
1. Select export electronic statement menu	System displays option for the export format type.	-	
2. Choose format type	System displays menu to choose the export location.	[Choose PDF as format type]	
3. Choose export location	System requests the relevant transaction history from the	[Choose desired location]	

	bank, which returns the requested information.	
	System exports the transaction history as an electronic statement in the desired format and location.	

UC-9 View Nearby ATM Locations

Test case ID	TC-28		
Test case name	View nearby ATM location		
Preconditions	GPS in the device is activated		
Action	Expected Results	Test Data	
1. Select view nearby ATM locations menu	System displays a map based on device's current location and nearby ATM locations within certain distance.	-	

UC-10 Manage Account Link Applications

Test case ID	TC-29		
Test case name	Approve submitted link application		
Preconditions	-		
Action	Expected Results	Test Data	
1. Select manage account link applications menu	System displays option to filter applications by start and end dates.	-	
2. Choose start and end dates	System displays list of submitted bank link applications filtered by chosen start and end dates.	[Choose 15/01/2019 as start date] [Choose 15/02/2019 as end date]	
3. Choose application from list	System displays an option to approve or reject the application.	-	
4. Choose to approve the application	System prompts a confirmation message.	-	
5. Confirm approval	System marks application as approved and notifies customer of the new status.	-	

Test case ID	TC-30
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Test case name	Cancel approving submitted link application		
Preconditions	-		
Action	Expected Results	Test Data	
1. Select manage account link applications menu	System displays option to filter applications by start and end dates.	-	
2. Choose start and end dates	System displays list of submitted bank link applications filtered by chosen start and end dates.	[Choose 15/01/2019 as start date] [Choose 15/02/2019 as end date]	
3. Choose application from list	System displays an option to approve or reject the application.	-	
4. Choose to approve the application	System prompts a confirmation message.	-	
5. Cancel approval	System ends the process.	-	

Test case ID	TC-31		
Test case name	Reject submitted link application		
Preconditions	-		
Action	Expected Results	Test Data	
1. Select manage account link applications menu	System displays option to filter applications by start and end dates.	-	
2. Choose start and end dates	System displays list of submitted bank link applications filtered by chosen start and end dates.	[Choose 15/01/2019 as start date] [Choose 15/02/2019 as end date]	
3. Choose application from list	System displays an option to approve or reject the application.	-	
4. Choose to reject the application	System displays a form with field for reason for rejection.	-	
5. Fill the corresponding field and press submit.	System prompts a confirmation message.	Reason = <i>Incorrect information</i>	
6. Confirm rejection	System marks application as rejected and notifies customer of the new status and rejection reason.	-	

Test case ID	TC-32		
Test case name	Cancel rejecting submitted link application		
Preconditions	-		
Action	Expected Results	Test Data	
1. Select manage account link applications menu	System displays option to filter applications by start and end dates.	-	
2. Choose start and end dates	System displays list of submitted bank link applications filtered by chosen start and end dates.	[Choose 15/01/2019 as start date] [Choose 15/02/2019 as end date]	
3. Choose application from list	System displays an option to approve or reject the application.	-	
4. Choose to reject the application	System displays a form with field for reason for rejection.	-	
5. Fill the corresponding field and press submit.	System prompts a confirmation message.	Reason = <i>Incorrect information</i>	
6. Cancel rejection	System ends the process.	-	

CHAPTER 5

PROJECT MANAGEMENT PLAN

5.1 Use Case Weight

5.1.1 Unadjusted Use Case Weight

UC	Use Case Name	Description	Category	Weight	Main Actor
UC-1	Register Customer's Account	Complex User Interface. 14 steps for main success scenario.	Complex	15	Customer
UC-2	Log in into Customer's Account	Complex User Interface. 9 steps for main success scenario.	Complex	15	Customer
UC-3	Apply to Link Bank Account	Average User Interface. 7 steps for main success scenario.	Average	10	Customer
UC-4	View Balance	Average User Interface. 4 steps for main success scenario.	Average	10	Customer
UC-5	View Transaction History	Average User Interface. 6 steps for main success scenario.	Average	10	Customer
UC-6	Transfer to Another Account	Complex User Interface. 8 steps for main success scenario.	Complex	15	Customer
UC-7	Manage Bill Payment	Complex User Interface. 27 steps for main success scenario.	Complex	15	Customer
UC-8	Export Electronic Statement	Complex User Interface. 8 steps for main	Complex	15	Customer

		success scenario.			
UC-9	View Nearby ATM Locations	Simple User Interface. 2 steps for main success scenario.	Simple	5	Customer
UC-10	Manage Account Link Applications	Complex User Interface. 14 steps for main success scenario.	Complex	15	Bank
Total				125	

5.1.2 Unadjusted Actor Weight

Actor	Category	Weight
Customer	Complex	3
Bank	Complex	3
Total		6

5.1.3 Technical Complexity Factor

Factor	Description	Weight	Assigned Value	Weight × Assigned Value
T1	Distributed system	2.0	5.0	10.0
T2	Response time/performance objectives	1.0	5.0	5.0
T3	End-user efficiency	1.0	4.0	4.0
T4	Internal processing complexity	1.0	3.0	3.0
T5	Code reusability	1.0	2.0	2.0
T6	Easy to install	0.5	5.0	2.5
T7	Easy to use	0.5	4.0	2.0
T8	Portability to other platforms	2.0	0.0	0.0
T9	System maintenance	1.0	4.0	4.0
T10	Concurrent/parallel processing	1.0	3.0	3.0
T11	Security features	1.0	5.0	5.0
T12	Access for third parties	1.0	0.0	0.0
T13	End-user training	1.0	3.0	3.0
Total (TF)				43.5
Technical Complexity Factor (TCF) = 0.6 + (0.01 × 43.5) = 1.035				

5.1.4 Environmental Complexity Factor

Factor	Description	Weight	Assigned Value	Weight × Assigned Value
E1	Familiarity with development process used	1.5	3.0	4.5
E2	Application experience	0.5	4.0	2.0
E3	Object-oriented experience of team	1.0	5.0	5.0
E4	Lead analyst capability	0.5	3.0	1.5
E5	Motivation of the team	1.0	4.0	4.0
E6	Stability of requirements	2.0	4.0	8.0
E7	Part-time staff	-1.0	0.0	0.0
E8	Difficult programming language	-1.0	0.0	0.0
Total (EF)				25.0
Environmental Complexity Factor (ECF) = $1.4 + (-0.03 \times 25.0) = 0.650$				

5.1.5 Use Case Point Calculation

1. Unadjusted Use Case Point (UUCP) = UUCW + UAW = 125 + 6 = 131
2. Total Use Case Point (UCP) = UUCP × TCF × ECF = 131 × 1.035 × 0.650 = 88.13025
3. Estimated size using UCP (assuming 25 hours per use case point)
= UCP × 25 / work hours per month = 88.13025 × 25 / 175 ≈ 12.59 months

5.2 COCOMO

COCOMO calculation will be based on function points and the assumption that Java language will be used.

5.2.1 Unadjusted Function Points

Size estimation using function points is defined as the following:

$$\text{UFP} / \text{Function points per month} = \text{Size}$$

The equation can be inversed as the following:

$$\text{UFP} = \text{Size} \times \text{Function points per month}$$

Hence, assuming there are 25 function points per month, UFP can be calculated as the following:

$$\text{UFP} \approx 12.59 \text{ months} \times 25 = 314.75 \text{ function points}$$

5.2.2 COCOMO

Software Scale Drivers	Precedentedness	Low
	Development Flexibility	Low
	Architecture / Risk Resolution	Nominal
	Team Cohesion	Nominal
	Process Maturity	Nominal
Software Cost Drivers		
Product	Required Software Reliability	High
	Data Base Size	Very High
	Product Complexity	High
	Developed for Reusability	Nominal
	Documentation Match to Lifecycle Needs	Nominal
Personnel	Analyst Capability	Nominal
	Programmer Capability	High
	Personnel Continuity	Very High
	Application Experience	High
	Platform Experience	Nominal
	Language and Toolset Experience	High
Platform	Time Constraint	High
	Storage Constraint	Very High
	Platform Volatility	Low
Project	Use of Software Tools	High
	Multisite Development	High
	Required Development Schedule	Nominal

Assuming the average salary for software engineers in Indonesia as IDR 7,500,000 per month, which is equivalent to USD 527.22 per month, below are the results of COCOMO calculation:

- **Software Development (Elaboration and Construction)**
 - Effort = 61.5 person-months × 22 workdays per person-month
= 1353 person-workdays
 - Schedule = 14.3 months × 22 workdays per month
≈ 315 workdays
 - Cost = USD 32431
 - Total Equivalent Size = 16681 SLOC

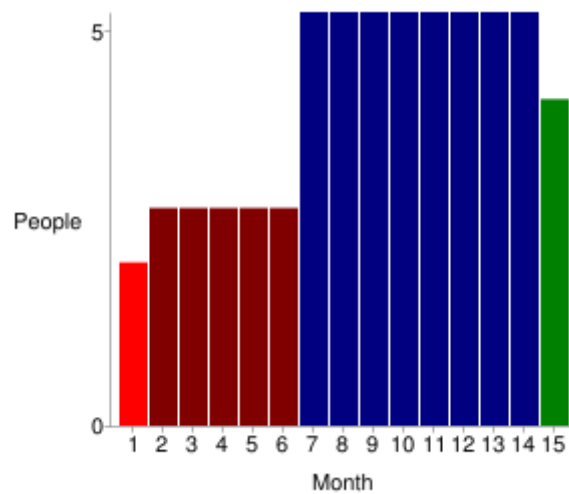
- **Acquisition Phase Distribution**

Phase	Effort (person-months)	Schedule (months)	Average Staff	Cost (USD)
Inception	3.7	1.8	2.1	1946
Elaboration	14.8	5.4	2.8	7784
Construction	46.8	8.9	5.2	24648
Transition	7.4	1.8	4.1	3892

- **Software Effort Distribution for RUP/MBASE (Person-Months)**

Phase/Activity	Inception	Elaboration	Construction	Transition
Management	0.5	1.8	4.7	1.0
Environment/CM	0.4	1.2	2.3	0.4
Requirements	1.4	2.7	3.7	0.3
Design	0.7	5.3	7.5	0.3
Implementation	0.3	1.9	15.9	1.4
Assessment	0.3	1.5	11.2	1.8
Deployment	0.1	0.4	1.4	2.2

- **Staffing Profile**



5.3 Activity Table

N o	Activity	Duration (person- days)	Person assigned	Duration (days)	Depend- ency	Mile- stone
1	Design Database for Customer	15	3	5	-	-
2	Create Database for Customer	24	2	12	1	-
3	Test Database for Customer	15	5	3	2	-
4	Revise Database for Customer	14	2	7	3	-
5	Design Database for Application	15	3	5	-	-
6	Create Database for Application	24	2	12	5	-
7	Test Database for Application	15	5	3	6	-
8	Revise Database for Application	14	2	7	7	-
9	Design Database for Bank Account	15	3	5	-	-
10	Create Database for Bank	24	2	12	9	-

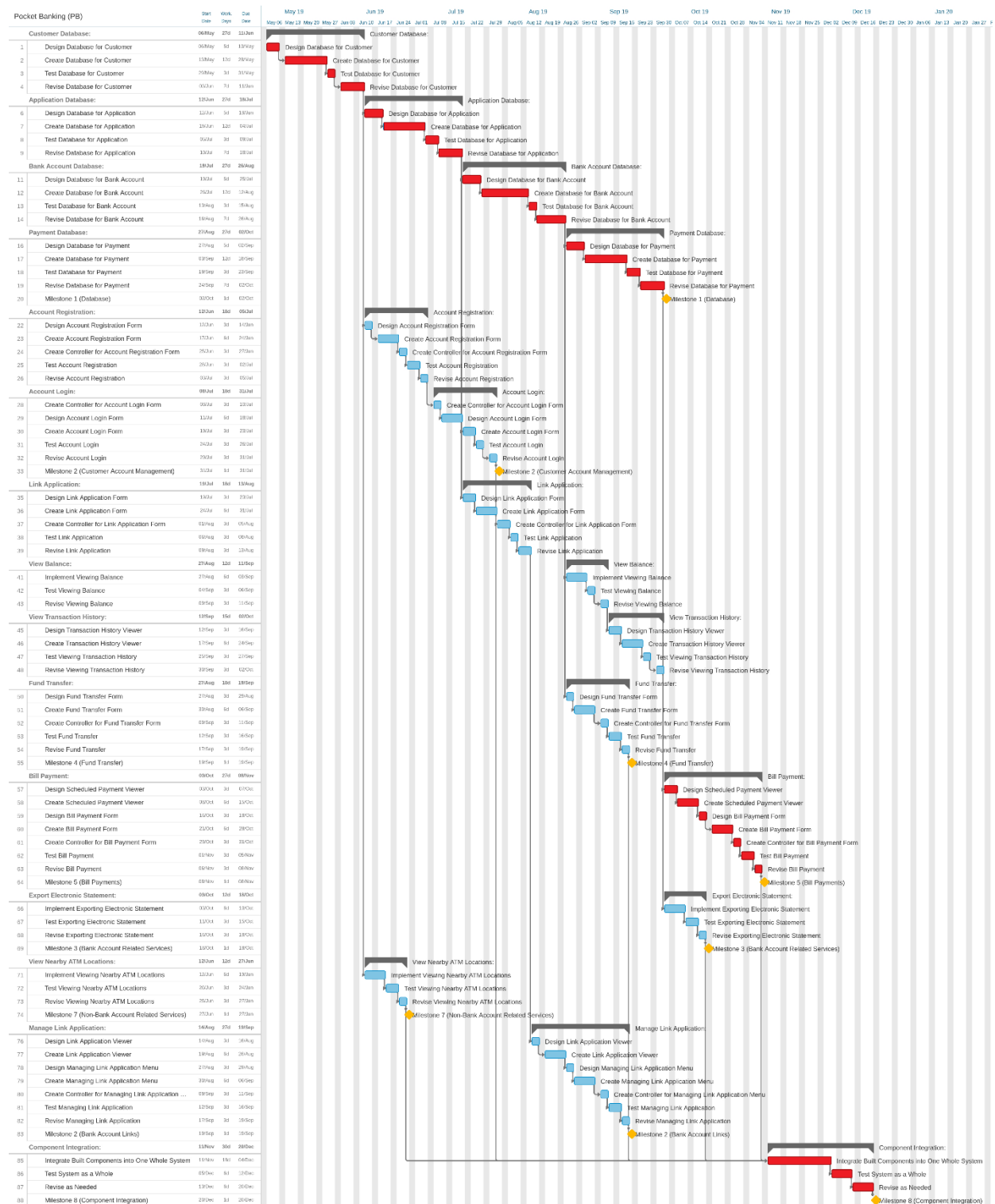
	Account					
11	Test Database for Bank Account	15	5	3	10	-
12	Revise Database for Bank Account	14	2	7	11	-
13	Design Database for Payment	15	3	5	-	-
14	Create Database for Payment	24	2	12	13	-
15	Test Database for Payment	15	5	3	14	-
16	Revise Database for Payment	14	2	7	15	1
17	Design Account Registration Form	15	5	3	4	-
18	Create Account Registration Form	36	6	6	4, 17	-
19	Create Controller for Account Registration Form	18	6	3	4, 18	-
20	Test Account Registration	15	5	3	4, 19	-
21	Revise Account Registration	12	4	3	4, 20	-
22	Design Account Login Form	15	5	3	4, 21	-
23	Create Account Login Form	36	6	6	4, 22	-
24	Create Controller for Account Login Form	18	6	3	4, 23	-
25	Test Account Login	15	5	3	4, 24	-
26	Revise Account Login	12	4	3	4, 25	2
27	Design Link Application Form	15	5	3	4, 8	-
28	Create Link Application Form	36	6	6	4, 8, 27	-
29	Create Controller for Link Application Form	18	6	3	4, 8, 28	-
30	Test Link Application	15	5	3	4, 8, 29	-
31	Revise Link Application	12	4	3	4, 8, 30	-
32	Implement Viewing Balance	36	6	6	4, 12	-
33	Test Viewing Balance	15	5	3	4, 12, 32	-
34	Revise Viewing Balance	12	4	3	4, 12, 33	-
35	Design Transaction History Viewer	15	5	3	4, 12	-
36	Create Transaction History Viewer	36	6	6	4, 12, 35	-
37	Test Viewing Transaction History	15	5	3	4, 12, 36	-
38	Revise Viewing Transaction History	12	4	3	4, 12, 37	-
39	Design Fund Transfer Form	15	5	3	4, 12	-
40	Create Fund Transfer Form	36	6	6	4, 12, 39	-
41	Create Controller for Fund Transfer Form	18	6	3	4, 12, 40	-
42	Test Fund Transfer	15	5	3	4, 12, 41	-

43	Revise Fund Transfer	12	4	3	4, 12, 42	5
44	Design Scheduled Payment Viewer	15	5	3	4, 16	-
45	Create Scheduled Payment Viewer	36	6	6	4, 16, 44	-
46	Design Bill Payment Form	15	5	3	4, 16, 45	-
47	Create Bill Payment Form	36	6	6	4, 16, 46	-
48	Create Controller for Bill Payment Form	18	6	3	4, 16, 47	-
49	Test Bill Payment	15	5	3	4, 16, 48	-
50	Revise Bill Payment	12	4	3	4, 16, 49	6
51	Implement Exporting Electronic Statement	36	6	6	4, 12	-
52	Test Exporting Electronic Statement	15	5	3	4, 12, 51	-
53	Revise Exporting Electronic Statement	12	4	3	4, 12, 52	4
54	Implement Viewing Nearby ATM Locations	36	6	6	4	-
55	Test Viewing Nearby ATM Locations	15	5	3	4, 54	-
56	Revise Viewing Nearby ATM Locations	12	4	3	4, 55	7
57	Design Link Application Viewer	15	5	3	4, 8, 12	-
58	Create Link Application Viewer	36	6	6	4, 8, 12, 57	-
59	Design Managing Link Application Menu	15	5	3	4, 8, 12, 58	-
60	Create Managing Link Application Menu	36	6	6	4, 8, 12, 59	-
61	Create Controller for Managing Link Application Menu	18	6	3	4, 8, 12, 60	-
62	Test Managing Link Application	15	5	3	4, 8, 12, 61	-
63	Revise Managing Link Application	12	4	3	4, 8, 12, 62	3
64	Integrate Built Components into One Whole System	88	5	18	16, 26, 38, 43, 50, 56, 63	-
65	Test System as a Whole	24	4	6	16, 26, 38, 43, 50, 56, 63	-

66	Revise as Needed	24	4	6	16, 26, 38, 43, 50, 56, 63	8
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No	Milestone	Activity Type
1	Database	Design and Implementation
2	Customer Account Management	Design and Implementation
3	Bank Account Links	Design and Implementation
4	Bank Account Related Services	Design and Implementation
5	Fund Transfer	Design and Implementation
6	Bill Payments	Design and Implementation
7	Non-Bank Account Related Services	Design and Implementation
8	Component Integration	Implementation and Analysis

5.4 Gantt Chart



5.5 Critical Path

The critical path is highlighted in red in the Gantt chart provided above.

APPENDICES

A.1. Assumptions

Some assumptions on which this document is based on include:

1. Transfers are done automatically, while payments can be scheduled or immediate. The details of how payments are processed are detailed in the requirements section.
2. For menus or forms with date selection, it is designed to be impossible to select an end date earlier than the start date and vice versa. Therefore, there is no further error handling done for date selection.
3. The menus for bank account related services (viewing balance, making transactions, etc.) are only visible after a bank account is linked.

A.2. Diagrams

The complete folder containing this document itself and the provided images or diagrams can be accessed here: <https://drive.google.com/open?id=129fIQE31tVo3Nkhpf0rBFk4hr1v16uvy>.

Alternatively, the following links provide access to the individual diagrams.

1. Class Diagram

<https://drive.google.com/open?id=14mLPKt7NJ6GGmaAWGW16FECVyreEjzR>

2. Use Case Diagram

<https://drive.google.com/open?id=124BNz8tZI-ZzRPVrkT8XfE-VPsXYKsmT>

3. Activity Diagrams

https://drive.google.com/open?id=1acOR-1bnlZ9_X-4q_m0s68vyeT8QujnG

4. Sequence Diagrams

<https://drive.google.com/open?id=1kN2kGuSFxSI9Y1Wu9fmxZRaSeNDuvkle>

5. COCOMO Chart

<https://drive.google.com/open?id=1k3VeG1wICP4M61BFGPm37TqCdbm4z645>

6. Gantt Chart

PNG: https://drive.google.com/open?id=1T4tFHSUqOOd9P_g4A0JNcG2x01-Qgu

XLS: <https://drive.google.com/open?id=1orlethPMZkFonMWIROxIKpz3C-kBdY1I>