Foreign Transaction Control System

for National Bank of Ethiopia

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A Project submitted to the school of Graduate Studies of Addis Ababa University In partial fulfillment of the requirements for the Degree of Masters of Science in Computer Science

March 2014

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF COMPUTER SCIENCE

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Acknowledgement

I would like to thank the almighty God who blessed me in every step of my life and entitled me for this opportunity. I also would like to take this opportunity to thank all the people who have helped me to complete this project from NBE and Commercial banks. I would like to thank sincerely my advisor Dr. Mulugeta Libsie for his invaluable guidance, encouragement and advice throughout this project. I wish to pass eternal thanks and all my gratitude to my family.

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Acronyms

NBE- National Bank of Ethiopia

FCY - Foreign Currency

FER - Foreign Exchange Reserves

Abstract

It is well known that in a developing countries like Ethiopia there is a negative tread balance. Therefore, it is vital to properly manage the countries limited foreign currency(FCY) by prioritizing the very crucial imports and other commitments. The National Bank of Ethiopia(NBE) has the mandate to manage and control the countries FCY.

The availability of on time data is crucial to effectively manage the countries limited FCY resource. The current mechanism for handling the FCY data of the country is limited on manual work which take some time to consolidate and may lead to human error. This project work has aimed to design and implement web based systems that can efficiently manage the inflow and outflow of FCY.

Requirements have been collected from NBE and Commercial banks. The design and implementation of the system is done in accordance to the identified functional and non functional requirements. Object oriented software engineering and ASP.NET 4.0 platform is used to develop the system.

Accordingly, the whole required data which help to the decision making are collected and analyzed. In addition, the current required report also collected and a web based system with a client server architecture is developed and tested by NBE and commercial bank users. The test result shows that the system is very helpful, minimize handoffs and minimize human effort, most importantly it is user friendly and easy to use. In general the project will minimize human interaction, produce timely and accurate report for prompt decision.

Keyword : Foreign transaction control system , Foreign currency exchange control system

Chapter One - Introduction

1.1 Background

Countries have their own institutions which implement and monitor their monetary and fiscal policies. In the case of Ethiopia the monetary policy and its administration is handled by the National Bank of Ethiopia (NBE). Among others, one of the responsibilities of NBE is to manage and administer the country's international reserves [1].

Foreign exchange reserves are liquid assets in foreign currency held by the National Bank of Ethiopia to support its monetary and foreign exchange policy. They are one of the instruments available to the National Bank of Ethiopia to meet the objective of ensuring currency stability and the normal functioning of the internal and external payments. The purpose of foreign exchange reserves management is to provide secure and efficient access to international liquidity and safeguard Central Bank's equity [2].

Central banks hold foreign exchange reserves for a variety of reasons, one of which is to maintain the capacity to intervene in exceptional circumstances in currency markets. Another is to provide liquidity to support currency boards and fixed exchange rate regimes. With the aim of reducing external vulnerability, foreign reserves holdings also take into consideration the country's external debt [6].

As per the Monetary and Banking Proclamation that established the National Bank of Ethiopia as a juridical body, it authorizes licensed commercial banks to operate foreign currency transaction like import, export, and remittance [3].

NBE manages the country's foreign exchange reserve through different means. One of these is by monitoring the country's foreign currency inflow and outflow. In line with this, it establishes a reporting system to all commercial banks and banks are required to report all incoming and outgoing foreign currency and their foreign currency denominated asset and liability on periodical basis.

As per the NBE direction, all banks are required to be networked and almost all banks have a central database. However, all banks will prepare a report on weekly basis and send to NBE in hard copy. Accordingly, NBE will consolidate the report and send to the concerned organs within and outside the organization for further analysis and decision making.

In addition, NBE monitors all transactions at individual basis and provides a list of delinquent exporters/importers to all commercial banks on monthly basis. The "Delinquent list" is a list containing names of exporters/importers who have not settled their foreign exchange commitments with NBE. Commercial banks are not allowed to give an export/import permit to a prospective exporter/importer whose name appears on the delinquent list. Any exporter/importer whose name appears on the delinquent list shall first clear his/her outstanding commitments at NBE. Once s/he has cleared her/his commitments a clearance certificate will be issued by the NBE [1].

Since the principal objective of National Bank of Ethiopia is to maintain price and exchange rate stability and support sustainable economic growth of Ethiopia, price stability is a proxy for macroeconomic stability which is vital in private sector economic decision on investment, consumption, international trade and saving.

Maintaining exchange rate stability on the other hand is considered as the principal policy objective of NBE so as to be competitive in the international trade and to use exchange rate intervention as policy tool for monetary policy to affect both foreign reserve position and domestic money supply [9].

Foreign exchange rate is a conversion rate into another [4] or the price of one country's currency expressed in another country's currency [5]. Accordingly, NBE fixes and sends middle exchange rate for currencies allowed to transact forex bureaus. NBE will send the rate through fax to commercial banks or commercial banks will update themselves from NBE’s website.

As it is briefly described above, there is a lot of manual work and hand offs between organizations and within the origination. In addition, to know the country’s foreign currency position, NBE shall collect all report in hard copy from commercial banks, and then summarize and analyze the reserve of all banks. Due to this, the bank is not in a position to know its actual

position at a real time basis and it is highly exposed for calculation error which might lead the bank and the county to severe risks.

In today's information age, it is incontestable the importance of knowing real time information and accurate data to take appropriate preventive measures. Hence, this project will propose an alternative foreign transaction control system to be implemented by the National Bank of Ethiopia.

1.2 Motivation

In developing countries like Ethiopia, there is a negative trade balance. Therefore, the country should utilize every foreign currency (FCY) earned in efficient and effective way. In Ethiopian case, every time an importer needs to import goods, it submits a foreign exchange application import form (5 copies) to be approved by commercial banks. If it is an exporter who needs to export goods, it submits a foreign exchange application export form (4 copies) to be approved by commercial banks.

The commercial banks send a report to NBE on a weekly basis for approved and utilized applications, the report mainly contains approved (issued) and be treated as outstanding commitment and utilized or settled transactions. Moreover, total FCY denominated asset and liabilities should be prepared and submitted to NBE in a preformatted hard copy. For every remittance received or sent commercial banks report to NBE with preformatted format in hard copy.

With the report received from commercial banks, NBE monitors commercial banks reserve (i.e., the total foreign currency deposit of the banks abroad).

On managing delinquent customers, an importer should go with a declaration from customs office to NBE to settle its commitment. For an exporter, commercial banks will send a report for the repatriation amount. Then NBE sends the delinquent list to commercial banks monthly via mail and sends the non-delinquent list by email daily.

NBE will prepare a daily exchange rate for currencies used for cash and transaction payment, the list of currencies with their buying and selling rate will be posted in NBE website and a hard copy will be sent to commercial banks.

With the above illustrated issues it is necessary to develop a system that can minimize human involvement, error, and waste of time and to enable NBE to manage the country's scarce resources in efficient and effective way by introducing state of the art controlling mechanism of foreign currency. However, despite the importance of the information, and its impact on the country's economy, to the knowledge of the researcher, there is no formal study conducted to address the above issue.

1.3 Statement of the Problem

Since Ethiopia has a problem of foreign currency shortage, result in shortage of foreign currency reserve. To minimize the risk of out of reserve for the payment of basic commitment of the country like importation of fuel and fertilizer, it is apparent that the country should strictly follow up its foreign currency reserve on a timely basis.

The existing method doesn't allow to frequently monitor and manage foreign currency, since the current reporting system has time interval and in hard copy which leads to re-writing the report which has a problem of human error, double human effort, time taking, misusing and hand off between different bodies.

1.4 Objectives

General Objective

The general objective of the project is to develop an efficient system that can help NBE to control foreign exchange currency.

Specific Objectives

The specific objectives of the project are:-

- To study the existing system
- Requirement analysis
- System design
- Implementation
- System level testing
- Deployment
- User acceptance testing
- Documentation/user manual preparation

1.5 Scope

The project is limited to foreign transactions monitoring by developing a system to control foreign currency exchange, to manage delinquent customer list and to fix and control foreign exchange rates for National Bank of Ethiopia with commercial banks.

This project doesn't cover managing and administration of loan and grant or other responsibilities of NBE like to license and supervise banks and hold commercial banks reserves and lend money to them.

1.6 Methodology

Data Collection

To collect reports and forms from NBE and commercial banks, document analysis, on-site observation, and interview has been used.

System Development

Object-Oriented Software Engineering Methodology is used for the overall system development. To develop the web based system, ASP.NET platform with C# programming language and MS SQL 2008 database is used. Crystal report is used to develop the reports.

1.7 Organization of the Project

The remaining part of this report is organized as follows. Chapter 2 covers the literature review part of this project where as Chapter 3 deals with requirements analysis of the project. The functional, non-functional and the system model are also presented in Chapter 3. Chapter 4 shows the proposed design of the system. Chapter 5 covers the implementation issues of the system. Finally, under Chapter 6, conclusion and future works are presented.

Chapter Two - Literature Review

2.1 Foreign Exchange Control

Foreign exchange controls are various types of restrictions a government places on the purchase or sale of local currencies to other types of currencies. Limitations are often placed either on the residents of the country where the controls are imposed, or on the non-residents of the country.

Foreign exchange controls are most often utilized by nations with weak currencies, and where there is significant demand for foreign currencies among their citizens. The use of foreign exchange controls can often hinder foreign investors who wish to move their funds to other countries. These controls attempt to create exchange stability by limiting exchange rate volatility due to currency flows across borders. Such controls are hypothetically utilized to stem the outflow of capital from the country with the weaker currency [12].

When foreign currency is used to fund a portion of domestic currency assets, banks need to analyze the market conditions that could affect access to foreign currency and understand that foreign currency depositors may seek to withdraw their funding more quickly than domestic counterparts. For that reason, banks should assess their ability to access alternative sources for repaying foreign currency liabilities. In countries such as Ethiopia, where the national currency does not have external convertibility, maturity mismatches result in higher liquidity risk, since a bank may have difficulty acquiring the necessary amount of foreign currency in a timely manner.

A bank should also have a measurement, monitoring and control system for its liquidity positions in major foreign currencies in which it is active. In addition to assessing its aggregate foreign currency liquidity needs and the acceptable mismatch in combination with its domestic currency commitments, the institution should also undertake separate analysis of its strategy for each currency individually.

Depending on the analysis undertaken above, a bank should, where appropriate, set and regularly review limits on the size of its cash flow mismatches over particular time horizons for foreign currencies in aggregate and for each significant individual currency in which the bank operates [13].

2.2 Foreign Transaction

Trade and financial transactions within a country are generally carried out in local currencies. When such transactions take place between persons/entities of two different countries that use different currencies, it is necessary to convert local currencies into foreign currencies or vice versa. These are known as foreign exchange transactions.

In order to facilitate such transactions, commercial banks appointed as Authorized Dealers in foreign exchange are permitted to buy, sell, lend and borrow foreign currencies in foreign exchange markets. These foreign exchange dealings are also treated as foreign exchange transactions. The rate at which the currencies are converted is the exchange rate. The buying and selling exchange rates are announced daily by the Central Bank [11].

Import of goods and services, export of goods and services, inward remittance and outward remittance are foreign transactions that are allowed by the National Bank of Ethiopia to be processed by licensed commercial banks.

Banks shall ensure that all customer and transaction records and information are available on a timely basis to the National Bank of Ethiopia and other competent law enforcement authorities [10]. Authorized commercial banks shall submit reports in prescribed forms indicating foreign exchange transactions for import and export applications, import and export transit as well as freight expenses every Monday on weekly basis to NBE [1].

2.3 Foreign Exchange Reserves

Foreign Exchange Reserves (FER) are liquid assets in foreign currency held by the Central Bank. They are instruments supporting monetary and foreign exchange policies, in order to meet the Bank's objective of safeguarding currency stability and the normal functioning of domestic and external payments.

The purpose of foreign exchange reserves management is to provide secure and efficient access to international liquidity and safeguard Central Bank's equity. The management of foreign exchange reserves is defined by the legal framework embedded in the Central Bank's Basic

Constitutional Act, based on a set of practices and policies in line with international recommendations in this field [8].

The risk is that the bank may suffer losses as a result of adverse exchange rate movements during a period in which it has an open position in a currency. Where the value of an asset/inflow exposures in one currency is not equal to the value of liability/outflow exposures in that currency this is described as an open position. Open positions may be short (liabilities exceed assets) or long (assets exceed liabilities). Banks with a short open position in a currency are exposed to the risk that the currency might appreciate, while those with a long open position in a currency are exposed to the risk that the currency might depreciate.

Exposure to this risk mainly occurs during a period in which the bank has a foreign currency open position, both on- and off-balance sheet, in spot markets. It is a risk of volatility due to a mismatch, and may cause a bank to experience losses as a result of adverse exchange rate movements during a period in which it has an open on, or off-balance sheet position in an individual foreign currency. Movements in exchange rates may adversely affect the value of a bank's foreign currency open positions. Currently, banks are allowed to take open positions in foreign currencies subject to regulatory limits set by NBE [13].

2.4 Foreign Exchange Rate

Basically, the real exchange rate can be defined as the nominal exchange rate that takes the inflation differentials among the countries into account. Its importance stems from the fact that it can be used as an indicator of competitiveness in the foreign trade of a country. The importance of the real exchange rate for a Central Bank is related with the effects of the real exchange rates on the Central Bank balance sheet and, in turn, with its ability to conduct a prudent monetary policy. Any changes in the real exchange rates would lead to fluctuations in short term capital flows. These fluctuations would then have an effect on the Central Bank’s net foreign assets. The changes in the volume of net foreign assets would lead to changes in the volume of currency in circulation on the liability side of the balance sheet. Thus, the changes in the volume of currency in circulation would necessitate the management of the liquidity fluctuations in the economy

through the utilization of the monetary policy tools by the Central Bank, whose final objective is price stability [7].

The de facto exchange rate regime is classified as a crawl-like arrangement, in light of the recent market developments. The authorities describe their exchange rate regime as a managed float with no predetermined path for the exchange rate. The pace of the depreciation, however, has been stable. The NBE supplies foreign exchange to the market based on plans established at the beginning of each fiscal year that takes into account estimates of likely supply and demand [9].

The middle rate for currencies used for transactions in foreign exchange is established by National Bank of Ethiopia.

Chapter Three - System Analysis

3.1 Functional Requirements

Functional requirements describe the interactions between the system and its environment independent of its implementation. The environment includes the user and any other external system with which the system interacts [14].

The proposed system is expected to provide the following functionalities:-

- **Register commercial banks:** The NBE administrator will register eligible commercial banks to process foreign transaction.
- **Create account for commercial banks and NBE users:** The NBE administrator will create and manage the account of the commercial banks and NBE users.
- **Register open position**: Open position is the commercial bank asset and liability in each currency in abroad banks. The commercial bank officer will register the commercial bank open position.
- **Register cash sell/buy**: Commercial banks should keep their asset and liability with 15% gap, if the asset exceeds the liability by 15% the commercial bank will sell to other commercial bank or buy if the liability exceeds the asset. The commercial bank officer will register the excess foreign currency sold and the foreign currency bought by the bank.
- **Register issued import permit**: The commercial bank officer will register the issued import permit from the foreign exchange application form.
- **Register utilized import permit**: The commercial bank officer will register the utilized import permit from the import transaction document.
- **Register issued export permit**: The commercial bank officer will register the issued export permit from the foreign exchange application form.
- **Register utilized export permit**: The commercial bank officer will register the utilized export permit from the export transactions documents.
- **Register inward remittance**: The commercial bank officer will register incoming remittances.

- **Register outward remittance**: The commercial bank officer will register outward remittance.
- **Register delinquent customer:** Delinquent customer is an exporter/importer who have not settled their foreign exchange commitments with NBE. The NBE officer will register this delinquent customers.
- **Release delinquent customer:** When the delinquent customer settled his/her commitment, the name of the customer will be removed from the delinquent list. The NBE officer will release the customer from the delinquent list.
- **Register foreign exchange rate:** The NBE officer will register the foreign exchange rate for the main currencies that are used in foreign transactions.
- **Generate different reports:** Providing of timely and summarized information.

3.2 Non-Functional Requirements

Non-functional requirements of the system are requirements that are not directly related to the functional aspect of the system. Instead, they describe user-visible features of the system.
The non-functional requirements of this system include features such as security, maintainability, and expandability.

Security: Since the system has sensitive financial data, the system must be confidential, the data must be integrated and the system should be available all the time except at the time of backup. Authentication, encryption and backup should be implemented to address the security need. Each user will be validated with a user name and password.

Maintainability and Expandability: The system will be designed in such a way that it can be easily maintained by the system developer or any authorized professional. Moreover, the system should be flexible enough to accommodate the future needs of expansion of commercial banks.

User Interface: The consistent user interfaces to be developed will help the system to be user friendly. For this reason, the interfaces and components of the interfaces will be designed in a user friendly fashion to help users interact easily with the system.

3.3 System Models

System models enable us to articulate complex ideas succinctly and precisely. In projects involving many participants, often of different technical and cultural backgrounds, accuracy and clarity are critical as the cost of miscommunication increases rapidly [15].

3.3.1 Use Case Model

Use case is a sequence of actions that provides a measurable value to an actor. Another way to look at it is that a use case describes a way in which a real world actor interacts with the system. In its simplest form, a use case can be described as a specific way of using the system from a user's (actor's) perspective. Use cases provide a means to capture system requirements, communicate with the end users and domain experts, and test the system. Use cases are best discovered by examining the actors and defining what the actor will be able to do with the system.

Actors

An actor represents anything or anyone that interfaces with the system. This may include people, external systems, and other organizations. The following actors are identified.

- Commercial bank officer
- NBE administrator
- NBE officer
- NBE supervisor

Use Cases

The following use cases are identified.

- Validate user
- Create account
- Register commercial bank
- Register open position
- Register cash sell/buy
- Register issued import permit
- Register utilized import permit
- Register issued export permit
- Register utilized export permit
- Register inward remittance
- Register outward remittance
- Register delinquent customer
- Release delinquent customer
- Register foreign exchange rate
- Generate report

Use Case Diagram

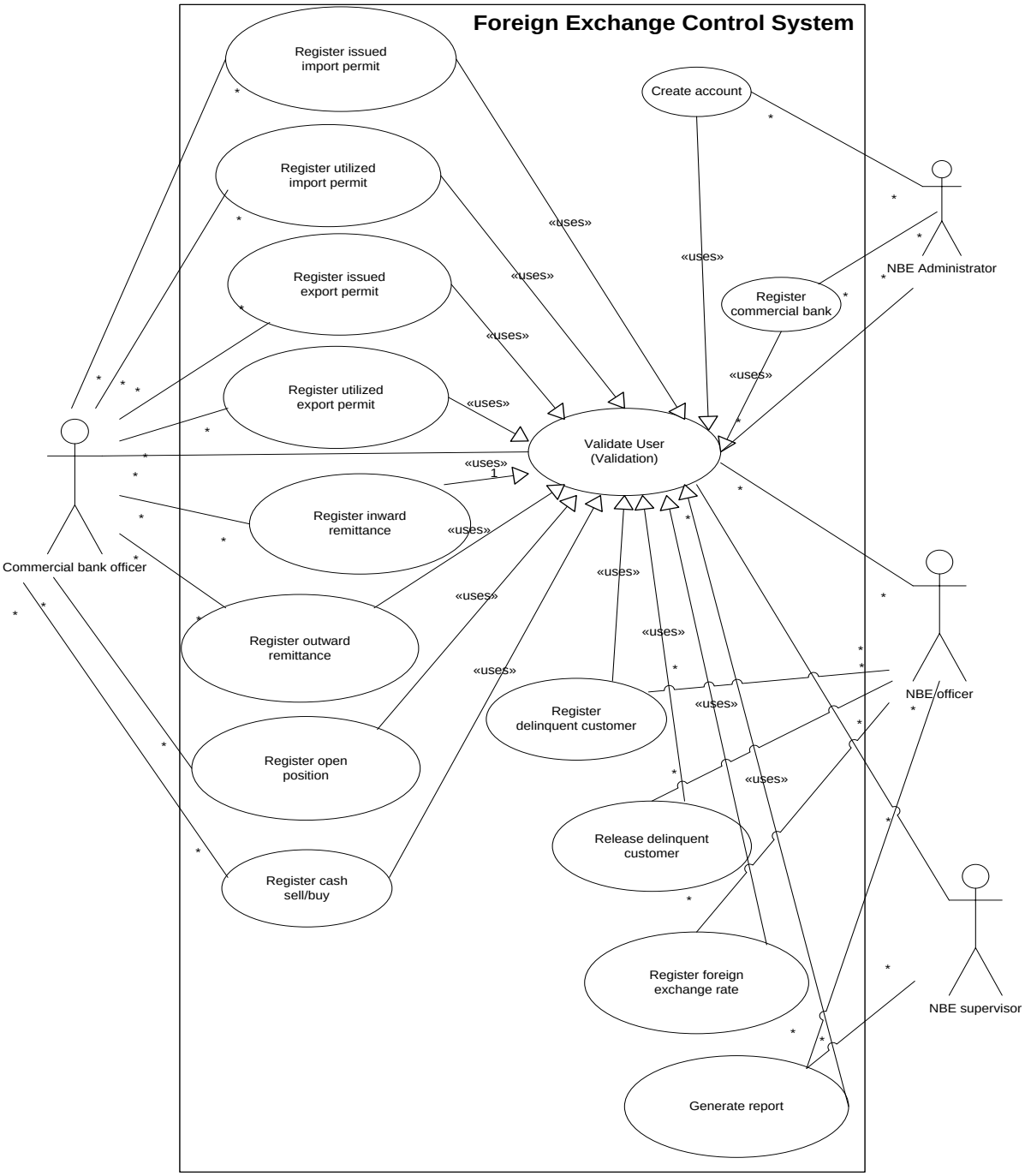

Figure 3.1: Use Case Diagram

Use Case Description

Use Case #	UC01
Use Case Name	Create account
Purpose of Use Case	Allows the NBE administrator to create an account
Participating Actor	NBE administrator
Precondition	NBE administrator must login to the system
Flow of Events	
1. The NBE administrator activates "Create User" option 2. The NBE administrator completes and submits the Create New User form providing user information (Alternative Course A: Blank Field) 3. The system creates the user (Alternative Course B: User ID already exists) 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	Account will be created
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	
Alternate Flow: B : " User ID already exists"	
B.1 The system displays "User Id already exists" error message B.2 The use case ends	

Use Case #	UC02
Use Case Name	Validate user
Purpose of Use Case	To login to the system by entering a combination of user name and password.
Participating Actor	Commercial bank officer, NBE administrator, NBE officer, NBE supervisor
Precondition	User must exist in system database
Flow of Events	
1.The user activates the login page 2. The user completes and submits user ID and passwords(Alternative Course A: Incorrect user ID or password) 3. The system displays main page 4. The use case ends	
Post Condition	User gets access to the system.
Alternate Flow: A : " Incorrect user ID or password"	
A.1. The system displays "Incorrect user ID or password" error message A.2. The use case ends	

Use Case #	UC03
Use Case Name	Register commercial bank
Purpose of Use Case	Allows the NBE administrator to record information about the commercial banks
Participating Actor	NBE administrator
Precondition	NBE administrator must login to the system
Flow of Events	
1. The NBE administrator activates "Register Commercial Bank" option 2. The NBE administrator completes and submits the Register Commercial Bank form providing detailed information about the commercial bank (Alternative Course A: Blank Field) 3. The system registers the commercial bank 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The commercial bank will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC04
Use Case Name	Register open position
Purpose of Use Case	Allows the Commercial bank officer to record information about the open position of the commercial bank
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Open Position" option 2. The Commercial bank officer completes and submits the Register Open Position form providing detail information about the open position (Alternative Course A: Blank Field) 3. The system registers the open position 4. The system compares the asset and liability (Alternative Course B: Excess or under foreign exchange) 5. The system displays acknowledgment message 6. The use case ends	
Post Condition	The open position will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	
Alternate Flow: B : " Excess or under foreign exchange"	
B.1 If the asset is more than liability by 15% B.2 The system displays "Excess sell foreign currency" message B.3 If the liability is more than the asset by 15% B.4 The system displays "Buy foreign currency" message B.5 The use case ends	

Use Case #	UC05
Use Case Name	Register cash sell/buy
Purpose of Use Case	Allows the Commercial bank officer to record information about the cash that is sold and bought of the commercial bank
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Cash sell/buy" option 2. The Commercial bank officer completes and submits the Register Cash sell/buy form providing detailed information about the cash sold or bought (Alternative Course A: Blank Field) 3. The system registers the cash sold or bought and update the commercial bank open position according to the transaction type(i.e. increase asset if it is buy or decrease if it is sell) 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The cash transaction will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC06
Use Case Name	Register issued import permit
Purpose of Use Case	Allows the Commercial bank officer to record information about the issued import permit
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Issued Import Permit" option 2. The Commercial bank officer completes and submits the Register Issued Import Permit form providing detail information about the import permit (Alternative Course A: Blank Field) 3.The system checks if the customer is delinquent (Alternative Course B: Delinquent customer) 4. The system registers the issued import permit and update open position of the commercial bank 5. The system displays acknowledgment message 6. The use case ends	
Post Condition	The issued import permit will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	
Alternate Flow: B : " Delinquent customer"	
B.1 The system displays "Delinquent Customer" error message B.2 The use case ends	

Use Case #	UC07
Use Case Name	Register utilized import permit
Purpose of Use Case	Allows the Commercial bank officer to record information about the utilized import permit
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Utilized Import Permit" option 2. The Commercial bank officer completes and submits the Register Utilized Import Permit form providing detail information about the utilized permit (Alternative Course A: Blank Field) 3. The system registers the utilized import permit and updates open position of the commercial bank 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The utilized import permit will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC08
Use Case Name	Register issued export permit
Purpose of Use Case	Allows the Commercial bank officer to record information about the issued export permit
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Issued Export Permit" option 2. The Commercial bank officer completes and submits the Register Issued Export Permit form providing detail information about the export permit (Alternative Course A1: Blank Field) 3.The system check if the customer is delinquent (Alternative Course B: Delinquent customer) 4. The system registers the issued export permit 5. The system displays acknowledgment message 6. The use case ends	
Post Condition	The issued export permit will be registered.
Alternate Flow: A1 : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	
Alternate Flow: B : " Delinquent customer"	
B.1 The system displays " Delinquent customer" error message B.2 The use case ends	

Use Case #	UC09
Use Case Name	Register utilized export permit
Purpose of Use Case	Allows the Commercial bank officer to record information about the utilized export permit
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Utilized Export Permit" option 2. The Commercial bank officer completes and submits the Register Utilized Export Permit form providing detail information about the utilized permit (Alternative Course A: Blank Field) 3. The system registers the utilized export permit and updates open position of the commercial bank 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The utilized export permit will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC10
Use Case Name	Register inward remittance
Purpose of Use Case	Allows the Commercial bank officer to record information about the inward remittance of the commercial bank
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Inward Remittance" option 2. The Commercial bank officer completes and submits the Register Inward Remittance form providing detail information about the inward remittance (Alternative Course A: Blank Field) 3. The system registers the inward remittance and updates open position of the commercial bank 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The inward remittance will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC011
Use Case Name	Register outward remittance
Purpose of Use Case	Allows the Commercial bank officer to record information about the outward remittance of the commercial bank
Participating Actor	Commercial bank officer
Precondition	Commercial bank officer must login to the system
Flow of Events	
1. The Commercial bank officer activates "Register Outward Remittance" option 2. The Commercial bank officer completes and submits the Register Outward Remittance form providing detail information about the outward remittance (Alternative Course A: Blank Field) 3. The system registers the outward remittance and updates open position of the commercial bank 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The outward remittance will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC012
Use Case Name	Register delinquent customer
Purpose of Use Case	Allows the NBE officer to record information about the delinquent customer
Participating Actor	NBE officer
Precondition	NBE officer must login to the system
Flow of Events	
1. The NBE officer activates "Register Delinquent Customer" option 2. The NBE officer completes and submits the Register Delinquent Customer form providing detail information about the delinquent customer (Alternative Course A: Blank Field) 3. The system registers the delinquent customer 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The delinquent customer will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC013
Use Case Name	Release delinquent customer
Purpose of Use Case	Allows the NBE officer to modify the customer status to non delinquent
Participating Actor	NBE officer
Precondition	NBE officer must login to the system
Flow of Events	
1. The NBE officer activates "Release Delinquent Customer" option 2. The NBE officer modifies and submits the Release Delinquent Customer form modifying the customer to non delinquent 3. The system updates the customer with non delinquent 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The customer will be non delinquent.

Use Case #	UC014
Use Case Name	Register foreign exchange rate
Purpose of Use Case	Allows the NBE officer to record information about the foreign exchange rate
Participating Actor	NBE officer
Precondition	NBE officer must login to the system
Flow of Events	
1. The NBE officer activates "Register Foreign Exchange Rate" option 2. The NBE officer completes and submits the Register Foreign Exchange Rate form providing detail information about the foreign exchange rate (Alternative Course A: Blank Field) 3. The system registers the foreign exchange rate 4. The system displays acknowledgment message 5. The use case ends	
Post Condition	The foreign exchange rate will be registered.
Alternate Flow: A : " Blank Field"	
A.1 The system displays error message A.2 The use case ends	

Use Case #	UC015
Use Case Name	Generate report
Purpose of Use Case	Allows the NBE officer and NBE supervisor to print/view available reports
Participating Actor	NBE officer, NBE supervisor
Precondition	NBE officer, NBE supervisor must login to the system
Flow of Events	
1. The user activates "Report" option 2. The system displays available report types 3. The user selects a report type. 4. The system displays the selected report type. 5. The use case ends	
Post Condition	The users will get summarized reports.

Some of the forms that are mentioned above in the use cases description are presented under annex A.

3.3.2 Class Diagram

Class diagrams describe the structure of the system in terms of classes and objects. Classes are abstractions that specify the attributes and behavior of a set of objects whereas objects are entities that encapsulate state and behavior [14].

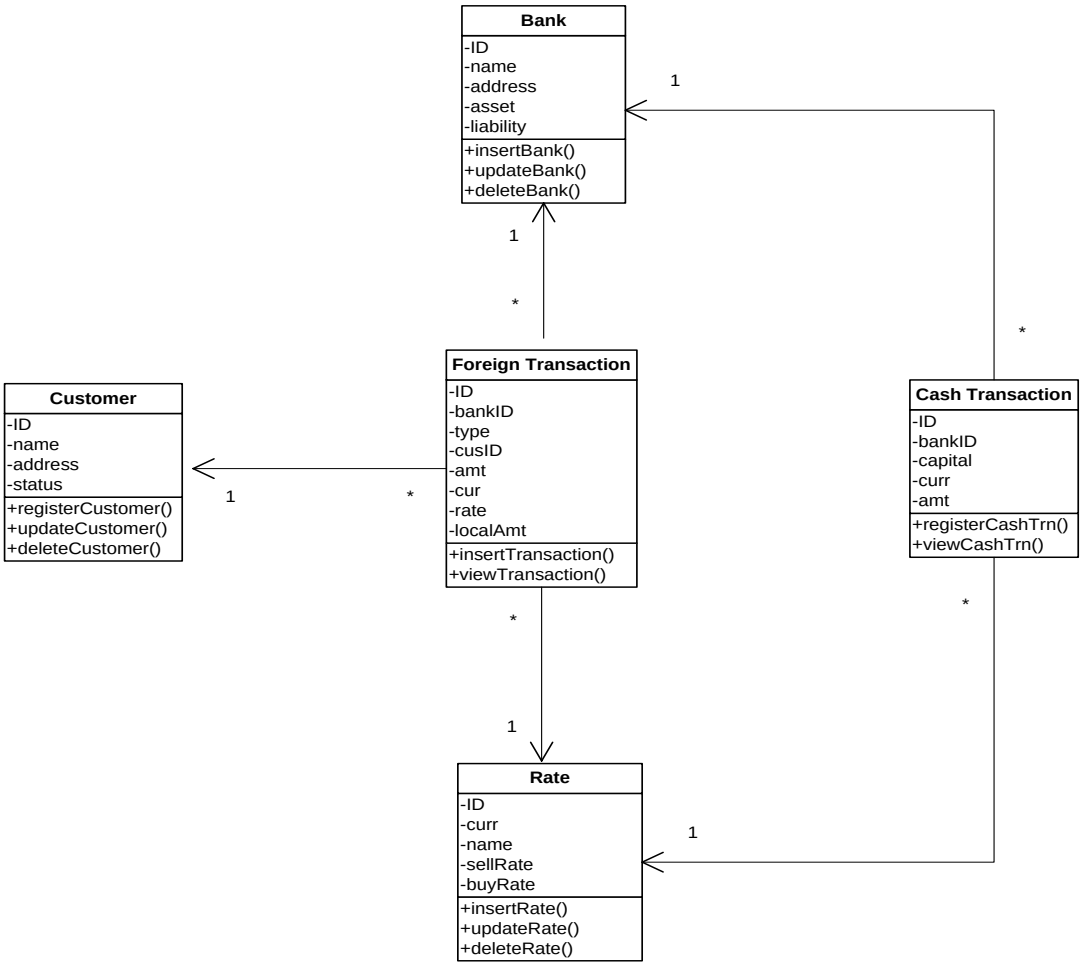

Figure 3.2: Class Diagram

The customer class will have the importers and exporters who made the foreign transaction(i.e. import, export, inward remittance and outward remittance transactions). Each foreign and cash transaction belongs to one commercial bank that is the bank class. Since the foreign and cash transactions are in foreign currency, they use the daily exchange rate which is the rate class.

3.3.3 Sequence Diagram

A Sequence diagram is a system model that is used to depict the interaction between participating objects in a given use case. The sequence diagrams for this particular system are organized in such a way that they can clearly show the participating objects in the given use case composed of user interfaces, control objects and persistent data elements. The sample sequence diagrams of the use cases are depicted on Figures 3.3-3.7. See the rest in annex B.

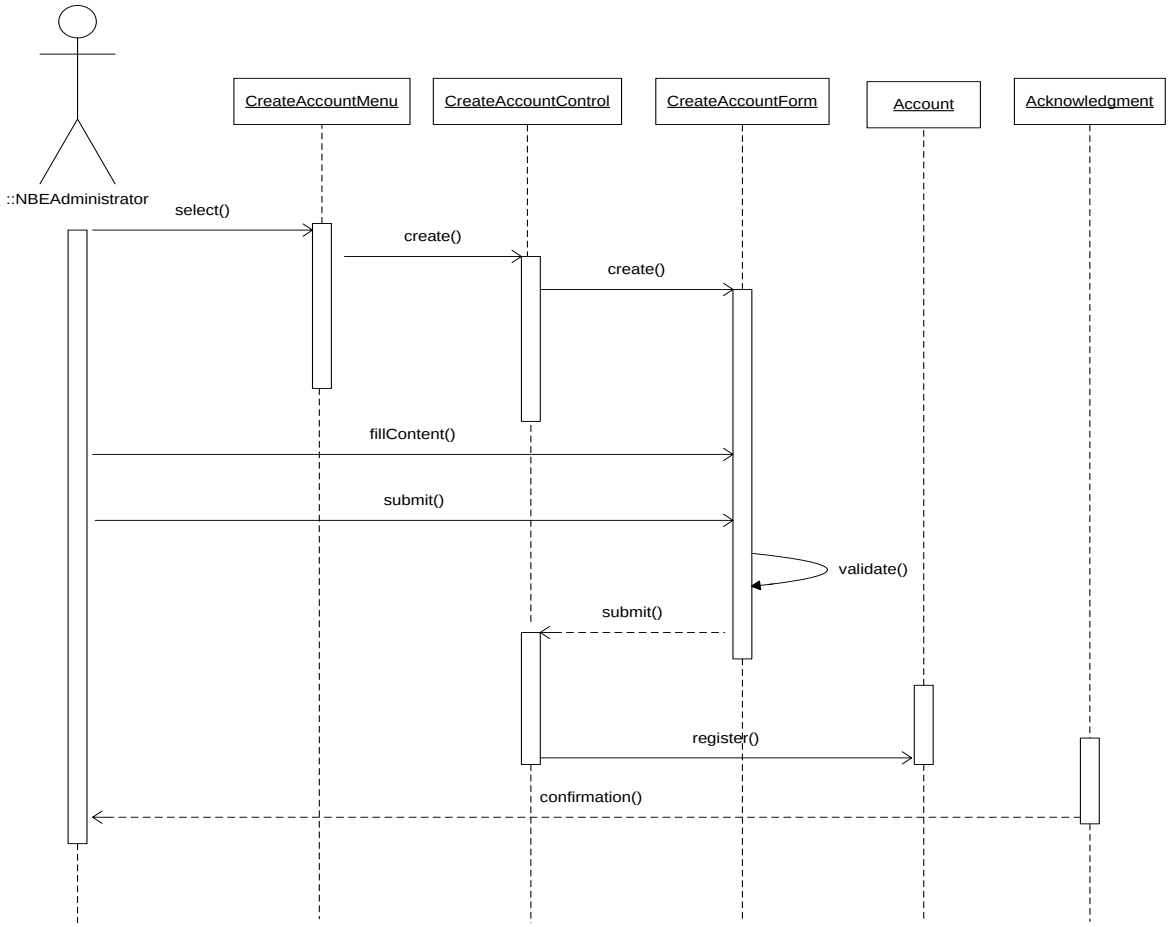

Figure 3.3: Sequence Diagram for Creating Account

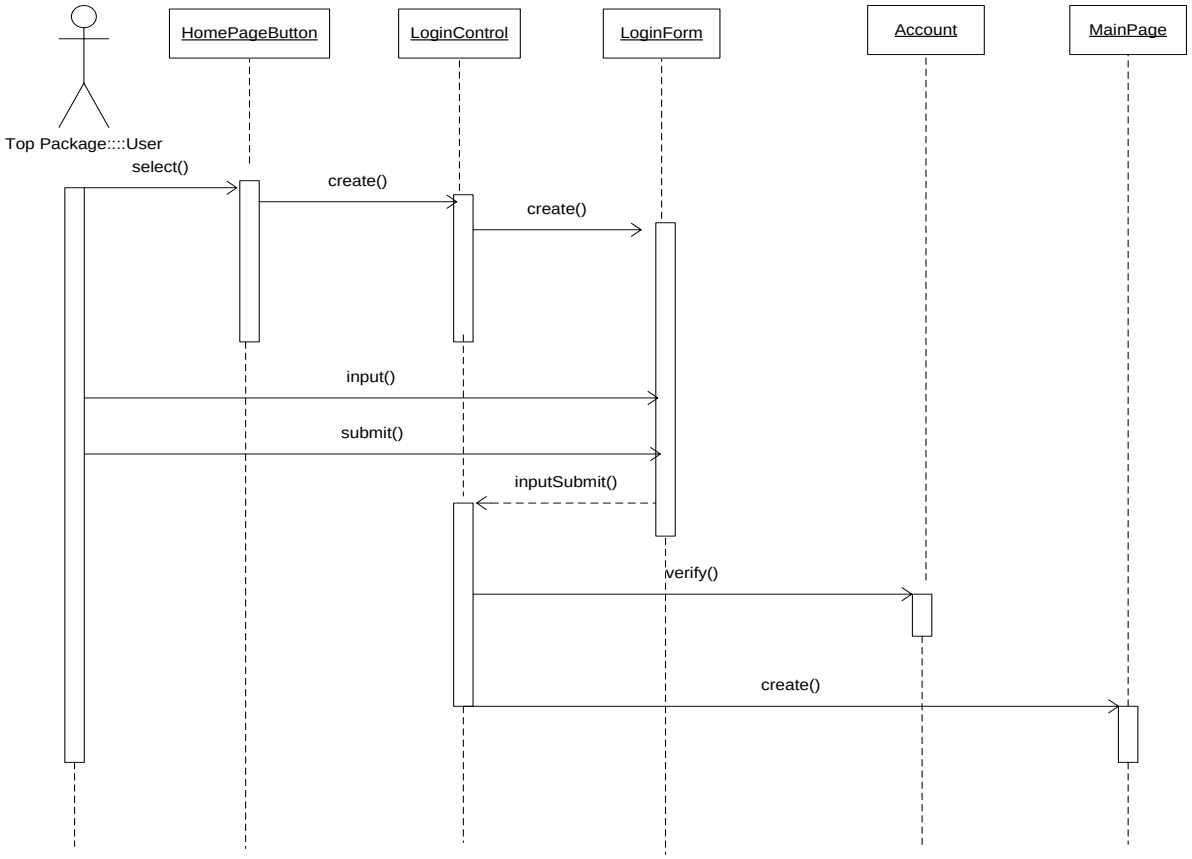

Figure 3.4: Sequence Diagram for user login

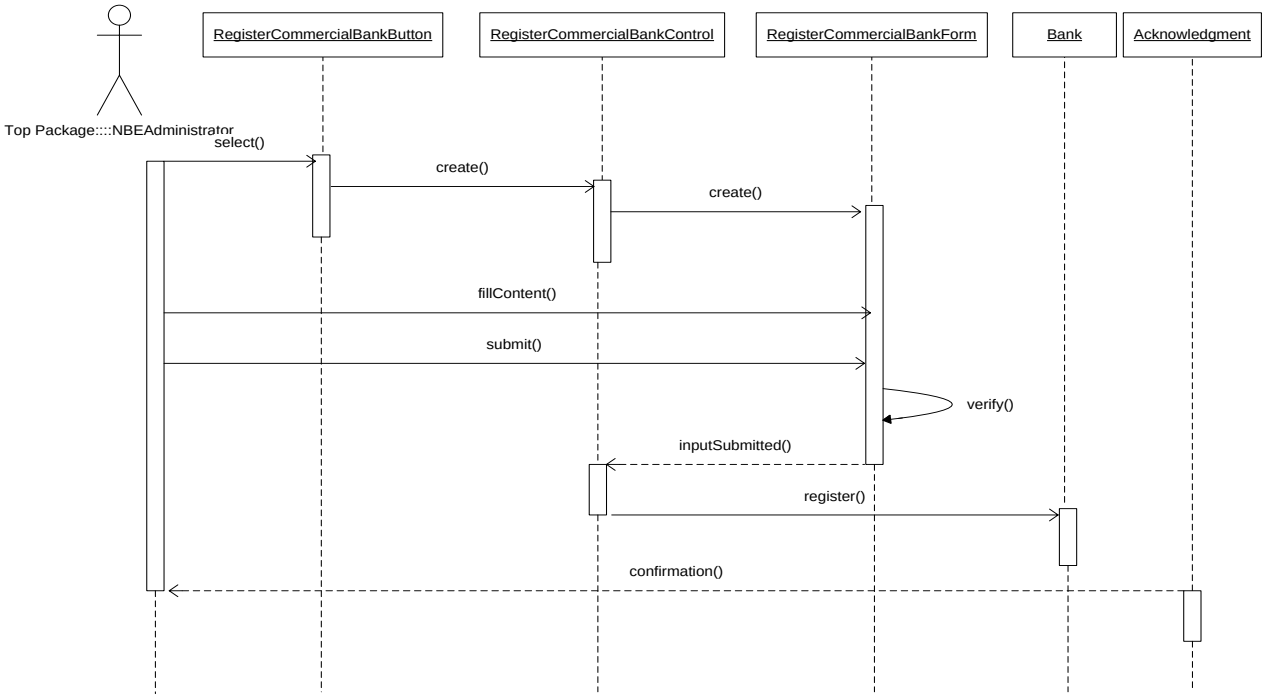

Figure 3.5: Sequence Diagram for registering commercial bank

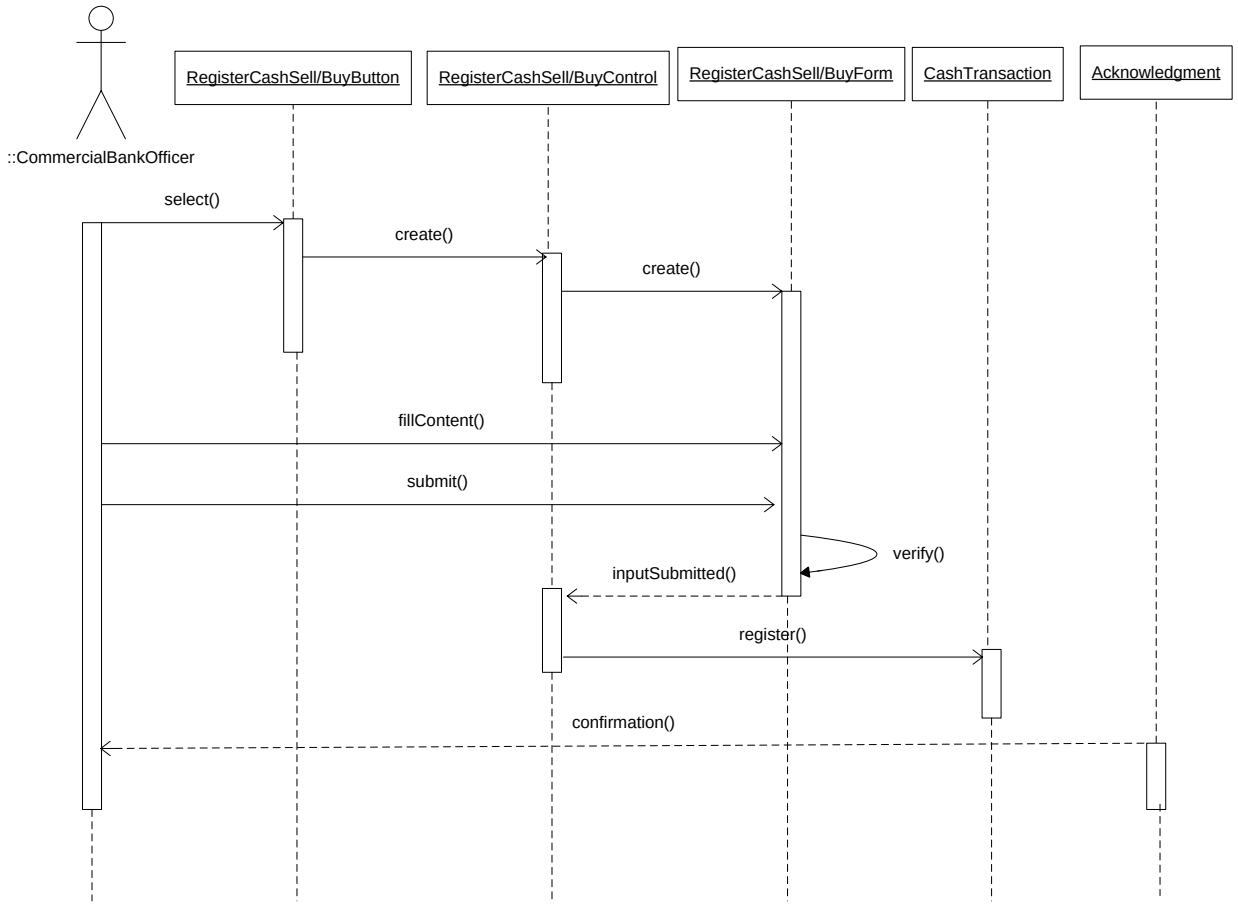

Figure 3.6: Sequence Diagram for registering cash sell/buy

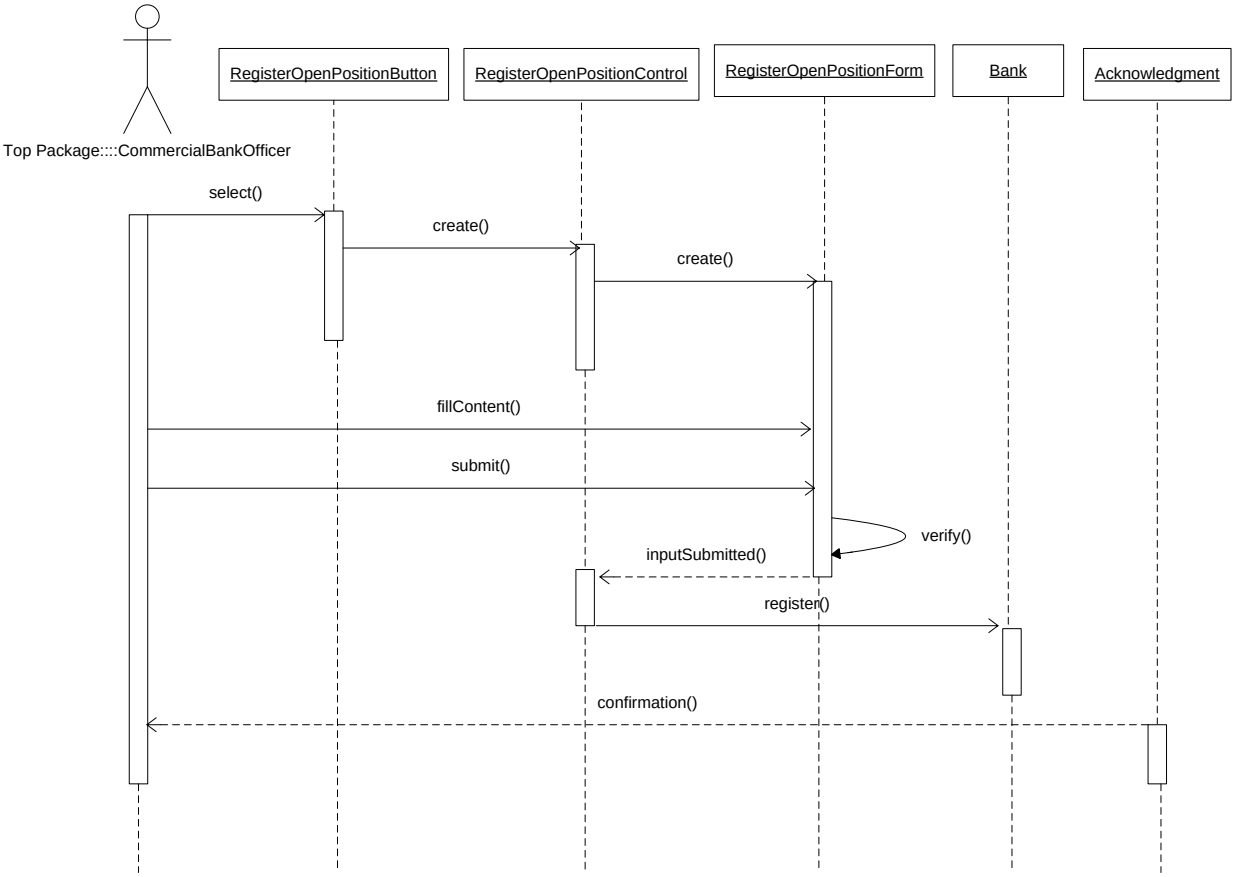

Figure 3.7: Sequence Diagram for registering open position

3.3.4 Activity Diagram

Activity diagrams show the work flow of the system. It illustrates what activities can be done in parallel, and the possibility of alternative paths through the work flow.

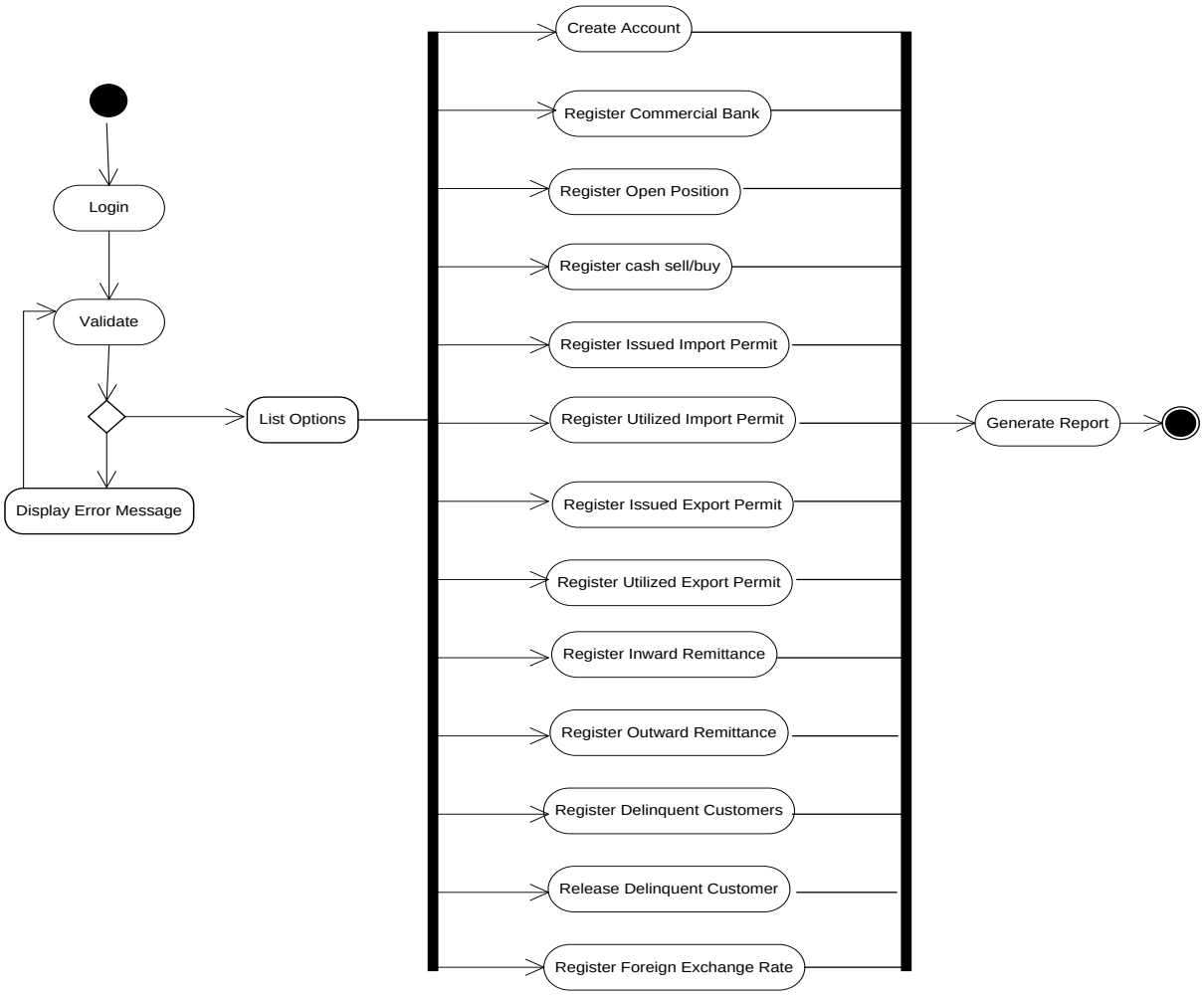

Figure 3.8: Activity diagram of the system

Chapter Four - System Design

System Analysis deals with the problem domain while System design is concerned in the solution domain in a software development. System design focuses on transforming the analysis model into the design model that takes into account the nonfunctional requirements and constraints described in the problem statement and requirement analysis.

This section describes design goals and considerations, provides a high-level overview of the system architecture, and describes the data design associated with the system, as well as the human-machine interface and operational scenarios. The high-level system design is further decomposed into low-level detailed design specifications for each of the system's components, including hardware and internal communications.

4.1 Design goals

Design goals of the system are derived from the non-functional requirements of the system. Design goals guide the decision to be made by the developers especially when trade-offs are needed.

4.1.1 Dependability criteria

Robustness: The system shall handle exceptions with exception handlers and validations. Invalid input data types which would normally raise exceptions and cause the system to halt with error shall be handled with exception handlers and users shall be prompted of the state by the system.

Reliability: The system shall perform as specified. The system shall operate to the level specified ensuring that all the specified design goals are realized in practice.

Availability: The system shall be available for normal use at any hour of the day except scheduled interruptions for taking backups of the system.

Fault tolerance: The system primarily relies on the primary database. But if the database failed it can be restored from the backup that is saved on external hard disk.

Security: The system's security shall be enforced with authentication and authorization. Any login request to the system shall be authenticated with user name and password. Furthermore authenticated users will be differentiated with privileges to access the system.

4.1.2 Maintenance criteria

Extensibility: The system should enable to add new functionality without any restriction. Existing classes' additional functionality shall be realized through adding only data, properties and methods coupled with necessary interface changes without any need for restructuring and recoding of the whole system.

Readability: The source code is going to be object oriented which has its own virtue in code readability since it states the objects, concepts and processes included in the business domain as classes and objects. Further the code shall apply an explanatory and understandable naming convention using mainly terms from the business domain and the code will be well commented.

4.2 Architecture

It is the architecture that determines the type of interactions that the components are going to have. The architecture that this work uses is client/server architecture. In this type of architecture the server is responsible to receive a request from the client and respond to the request, whereas the client is responsible to interact with that of the users of the system.

The server parts of this work are of two types. The first type is a web server, which is responsible to receive browsers' request through HTTP protocol and responds accordingly. Whereas the second type of server is a database server, which is responsible to provide the requested database services to the web server. The database server is generally responsible for modification and insertion of data to the database. It can only communicate with the web server.

The client side is a web browser which receives requests from the user of the system and responds to the request by communicating with the web server. If the user has a request on data, the browser passes the request to the web server then the web server passes the request to the database server. Both web and database servers will be placed at NBE, commercial banks and NBE users will access it using browser. The architecture of the system is depicted in Figure 4.1.

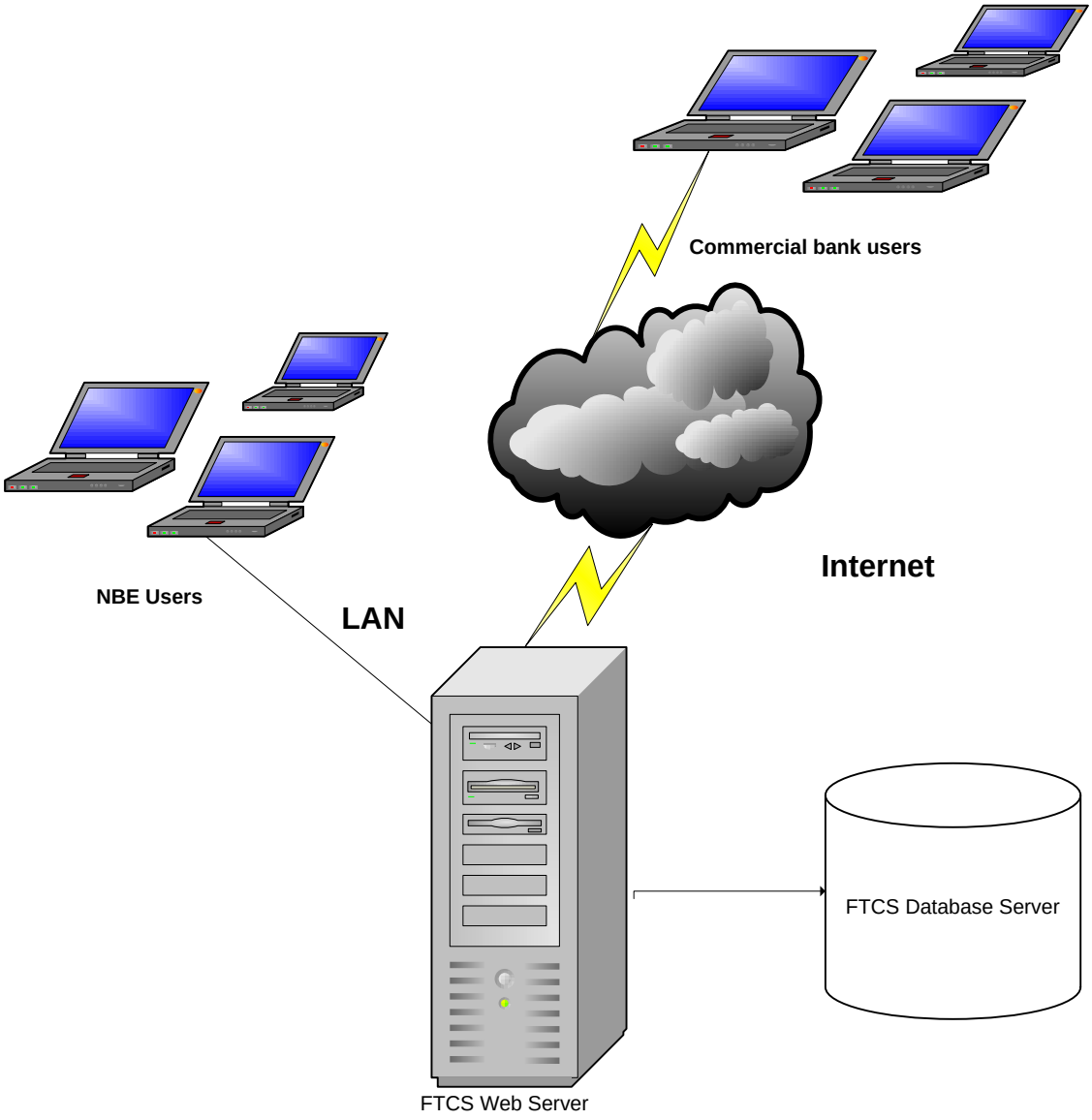

Figure 4.1: The Foreign Transaction Control System Architecture

4.3 Subsystem Decomposition

In order to simplify and minimize complexity of the solution domain, the system has been divided into three subsystems. These are registration subsystem, Reporting subsystem and Administration subsystem. Figure 4.2 depicts the subsystem decomposition.

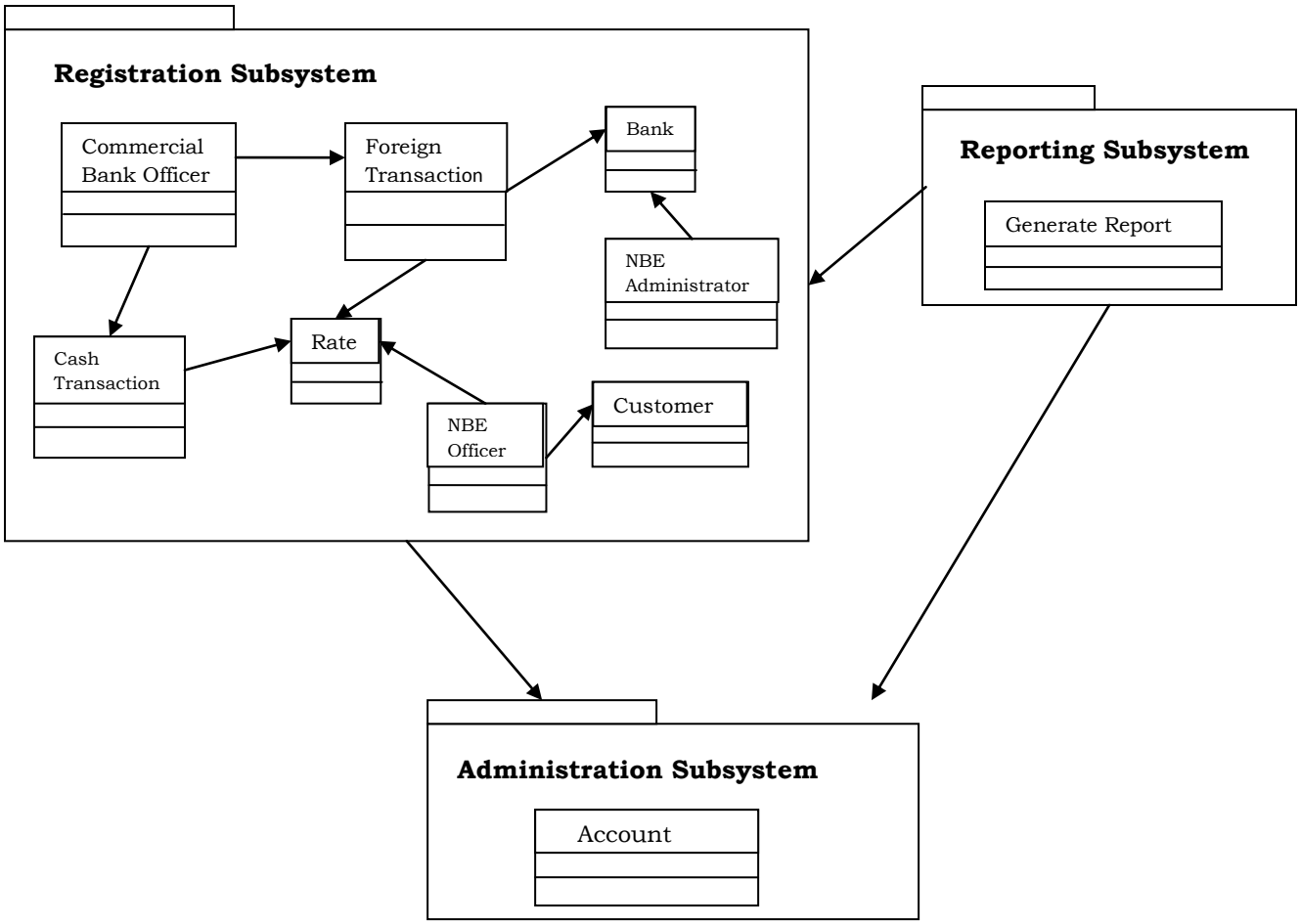

Figure 4.2: Subsystem decomposition of the system

The registration subsystem

The registration subsystem is used to record information regarding commercial banks, open positions, cash transactions, foreign transactions, customers, and rate. This subsystem uses administraion subsystem and it provides service to Report Handling subsystem.

Reporting subsystem

This sub system handles all report related issues in the system and uses services from registration and administraion subsystems.

Administration subsystem

This subsystem enables the administrator to manage user accounts. The management includes creation of new accounts, removing the existing accounts and modification of accounts. The management of user account is the responsibility of the account class. The account class is the one that creates, displays, and modifies the user account. This subsystem provides service to all subsystems; every user first need to get authontication prior to using the system.

4.4 Hardware/Software Mapping

One of the major and important tasks in system design deals with hardware/software mapping. The hardware/software mapping describes how it is possible to realize the subsystems (i.e., hardware/software) and how the object model is mapped on the chosen hardware and software.

The client-server architecture is represented in the deployment diagram of Figure 4.3.

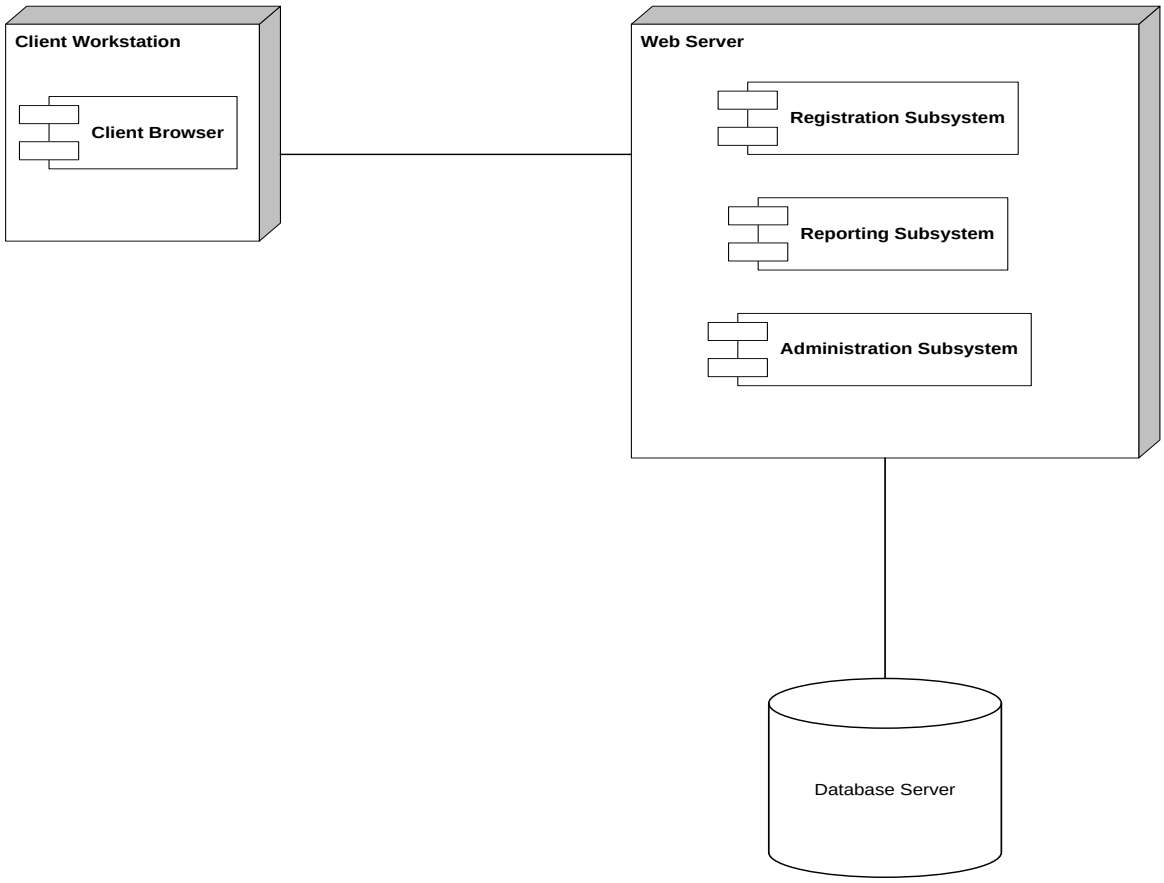

Figure 4.3: Deployment Diagram of the System

4.5 Persistent Data Management

The information regarding users account, commercial banks, open positions, customers, foreign transactions and exchange rate is stored persistently in a relational database. The system will permit different users to have different views of the system and to allow concurrent access to the system's information and other related issues.

Mapping

In order to create the persistent data management, the classes that are identified after the requirements of the system (i.e., in Chapter 3) should be mapped into tables. In addition to this, the attributes of the classes are mapped into table fields.

Figure 4.4, shows the list of tables, attributes together with the data type and the relationships among tables.

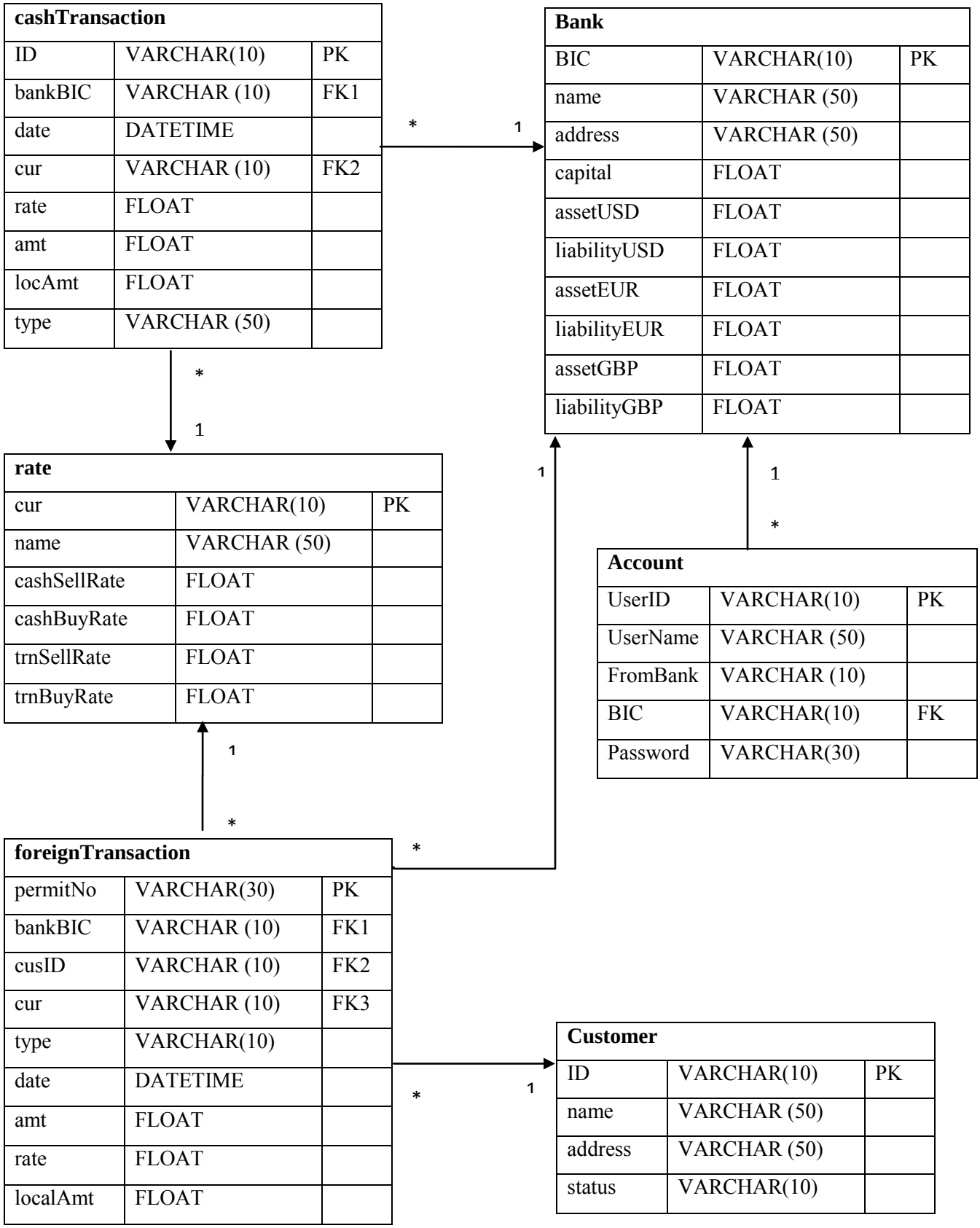

Figure 4.4: Tables and Relationship

Chapter Five - Implementation

This Chapter discusses the system development tools applied for implementing the Foreign Transaction Control System, prototype of the system and testing of the system.

5.1 Development Tools

To develop the system different tools are applied. For development environment Microsoft Visual Studio 2010 is used. Since our system is web based ASP.NET with .NET Framework 4.0 is used. The programming language that is used to develop is C#. Since web applications written in ASP.NET are fast, efficient, manageable, scalable, and flexible, but, above all, easy to understand and to code, ASP.NET is used to develop the system. C# is used for development since it is a truly modern language with all the features such as full object-orientation, automatic memory management, and housekeeping. Crystal report is used to develop the reports.

Microsoft SQL 2008 is a Relational Database Management System (DBMS) that is used in this project to store persistent data of the system. This DBMS is used particularly because it is reliable and easy and can be well integrated with MS Visual Studio.

5.2 Prototype

As it is stated in system design the Foreign Transaction Control system is composed of administration, registration and reporting subsystems. Hence, in this section, a brief overview is given regarding each component of the system. In addition to this, screen shots of the components are included to make the discussion more clear.

To login to the system a user ID must be first created by the system administrator. Users from NBE and commercial bank will have different privilege to access the system. When the system is being activated, the login form of the system is displayed as shown in Figure 5.1.

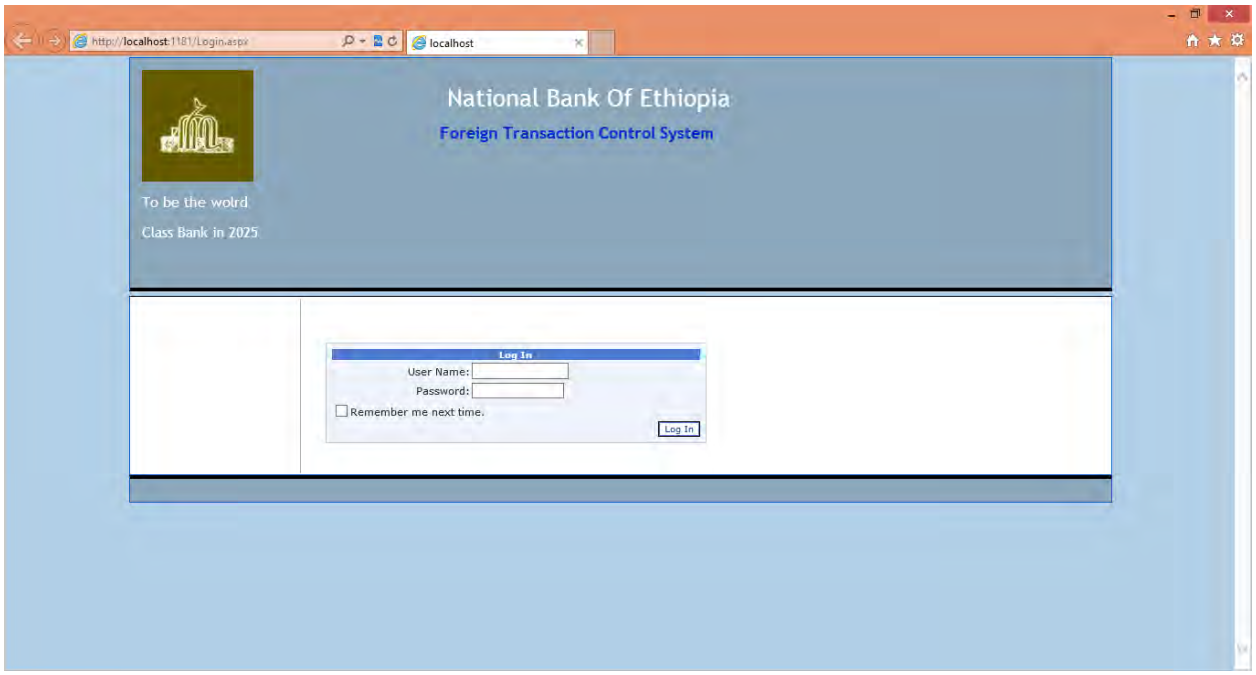

Figure 5.1: Foreign Transaction Control System Login form

When the user successfully login the home page of the system will be displayed as shown below. The home page consists of different menus; Change Password, Help and Logoff are enabled for every user. The other menus enabled as per the users privilege.

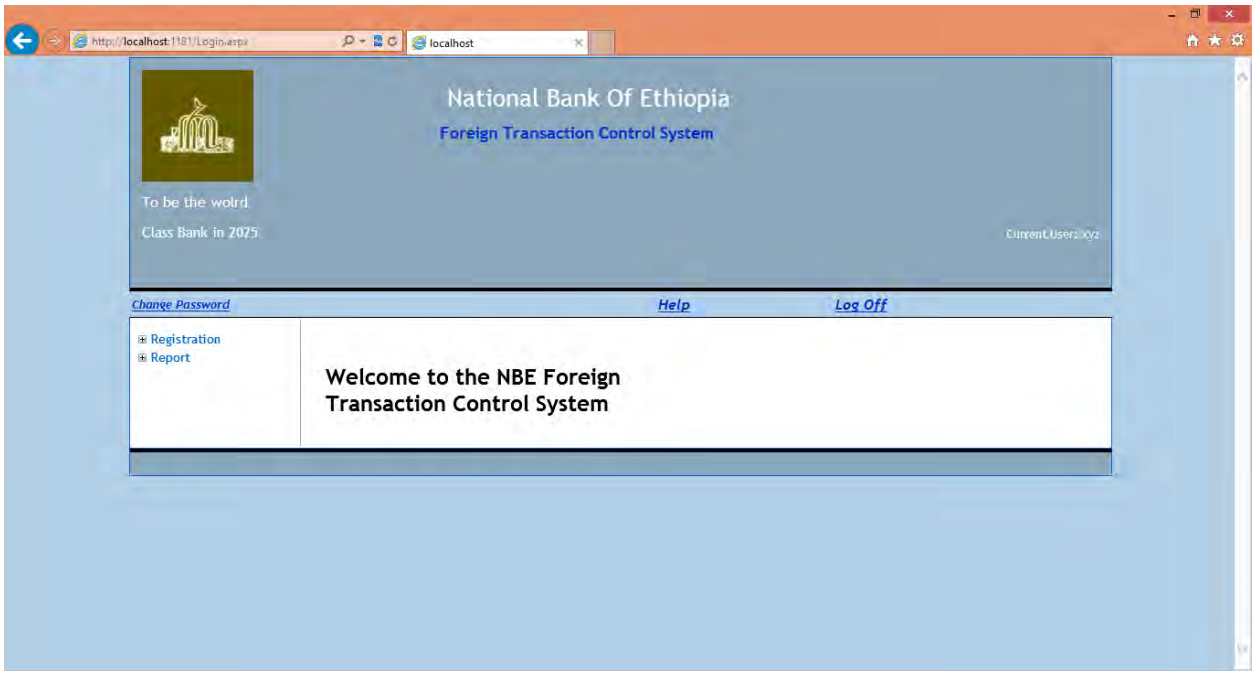

Figure 5.2: Foreign Transaction Control System Home Page

5.2.1 Administration

One of the components of the system is the administration subsystem by which administrators will manage user accounts. When the administrator login the Create User link will be enabled and opens the Create User form as shown in Figure 5.3, which is used to create new users of NBE and commercial banks.

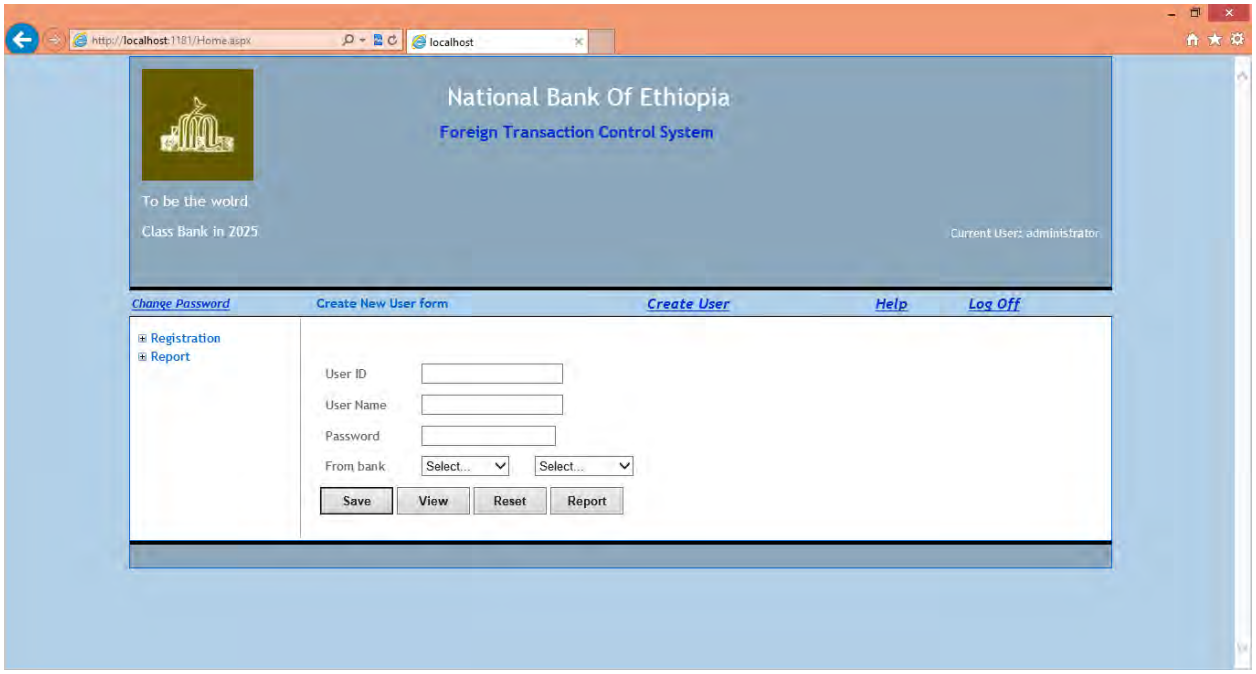

Figure 5.3: Create User form

5.2.2 Registration

The registration component is composed of registration of commercial bank detailed information, commercial bank cash transaction, delinquent customers and commercial banks foreign transaction.

Once the user selects the Register Commercial Bank menu, the below form as shown in figure 5.3 will be displayed so the information of the bank can be entered. For this reason, the user is expected to fill out the form. After successful registration, the system displays a confirmation message. In this form a new bank can be registered with the unique bank BIC, name of the bank,

address and capital of the bank. Existing bank information can be viewed by entering the valid bank BIC. Update can also be made for existing bank or even a bank can be deleted.

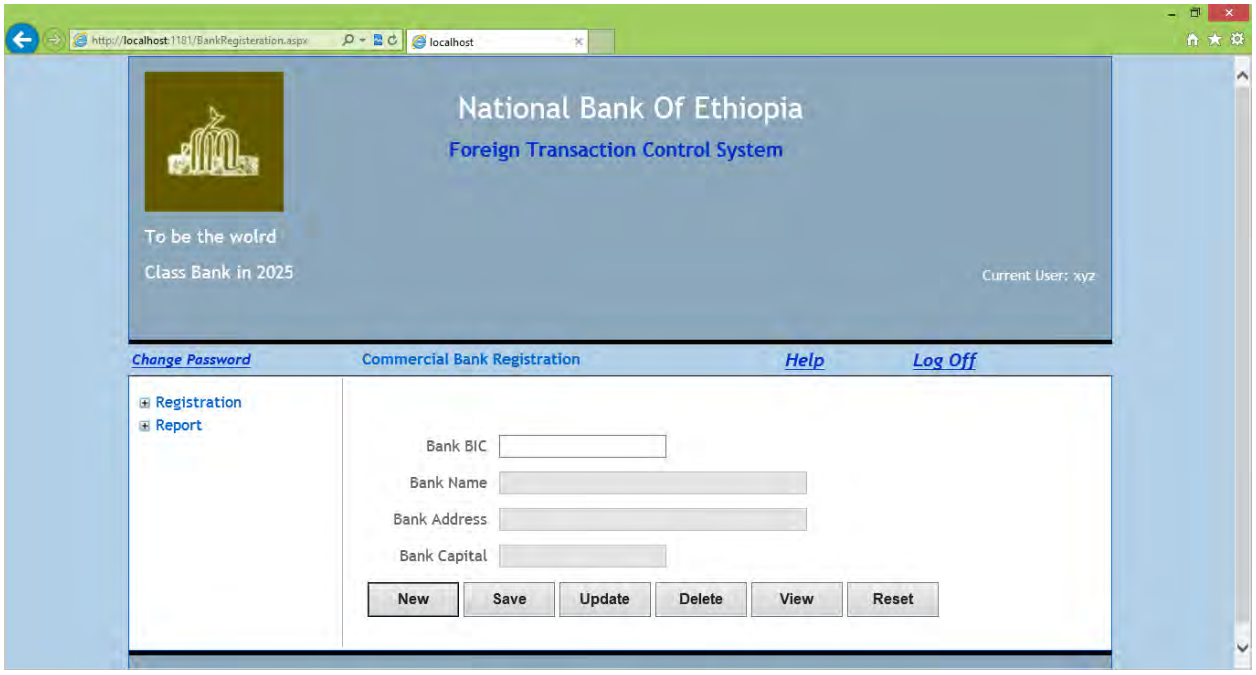

Figure 5. 4: Commercial Bank Registration Form

As shown in Figure 5.5 register delinquent customer form is used to register delinquent customers by NBE officers. A new delinquent customer can be added with NBE given ID, name, address and status to the system. An existing customer can be viewed, updated or delete.

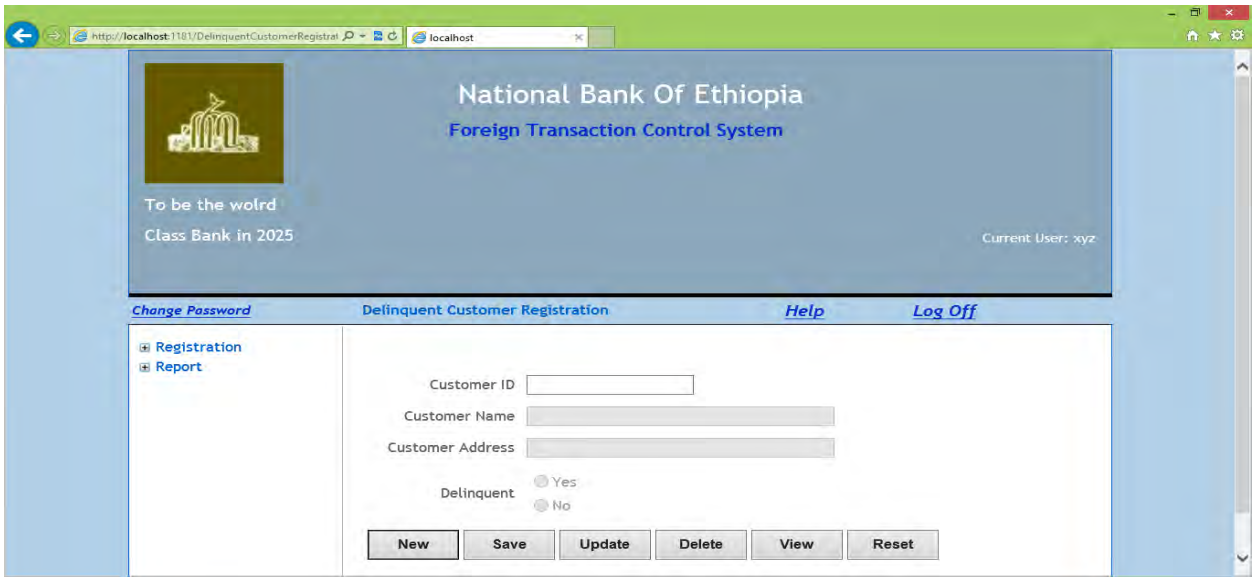

Figure 5.5: Register Delinquent Customer Form

When the customer is released from delinquent list the status will be changed from ‘Yes’ to ‘No’ on Release Delinquent Form as shown below.

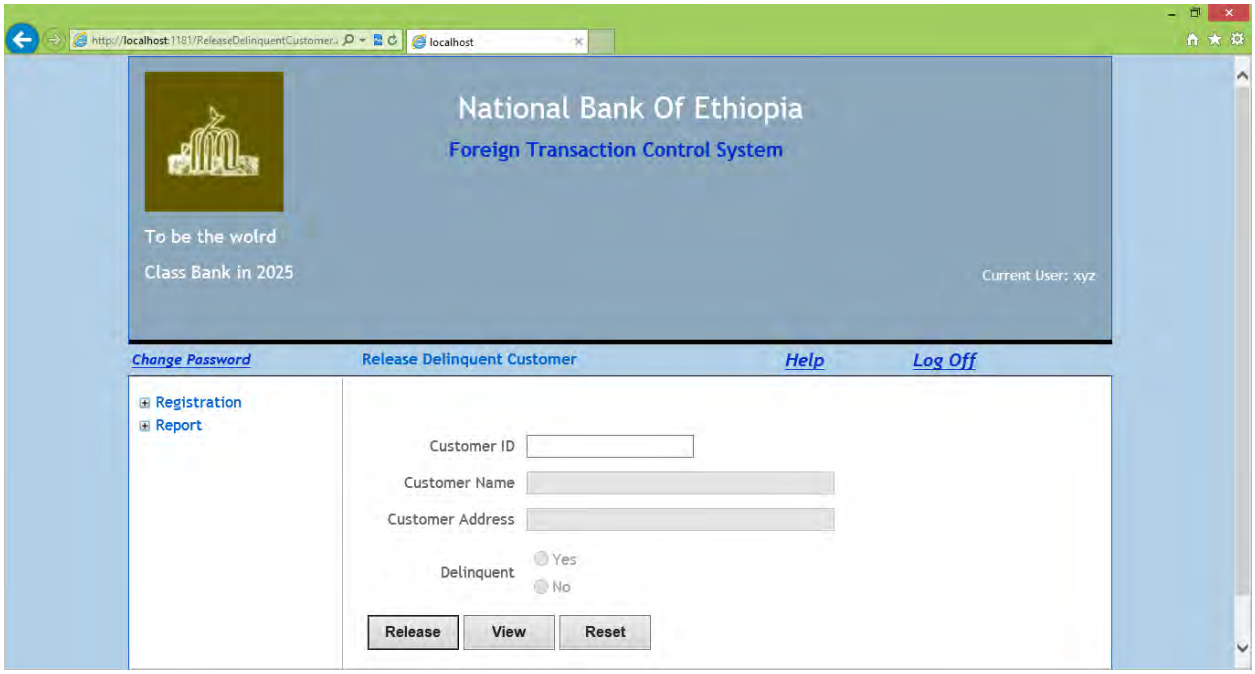

Figure 5. 6: Release Delinquent Form

Open position of the commercial banks can be register, update or view by Open Position form as shown in Figure 5.7. When the user register, update or view the bank open position the system will check and display a warning message if the asset exceed the liability by 15% or vice versa as shown in figure 5.8.

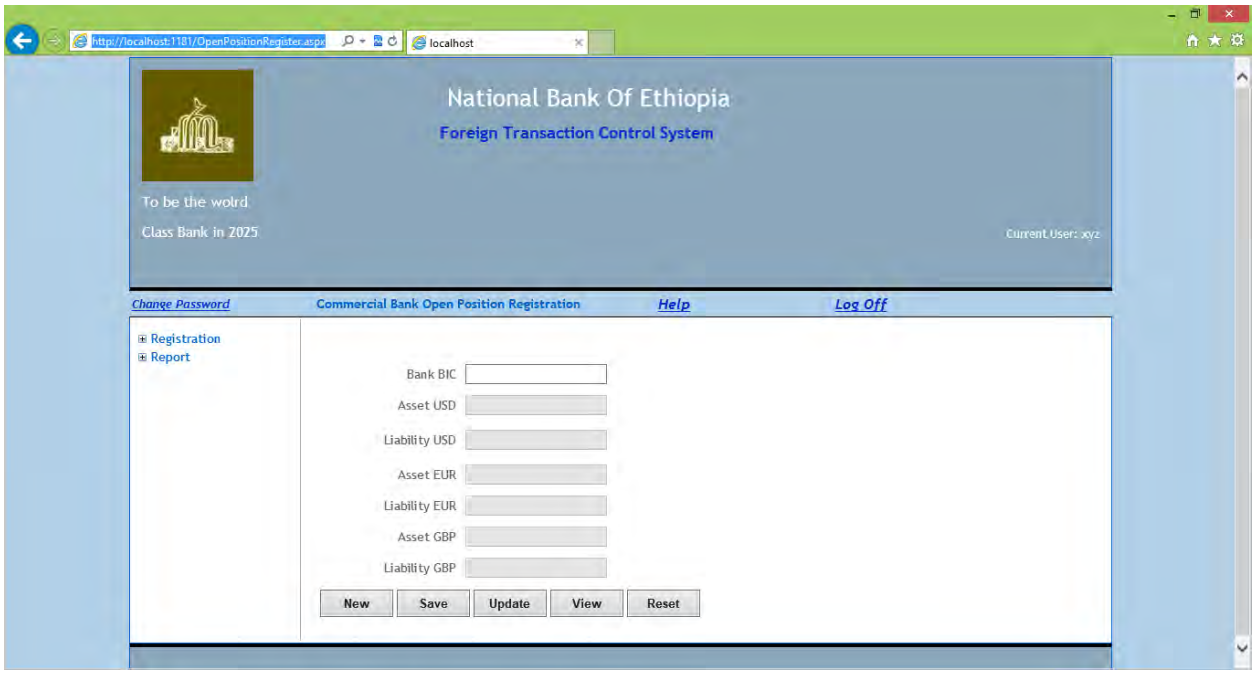

Figure 5.7: Open Position form

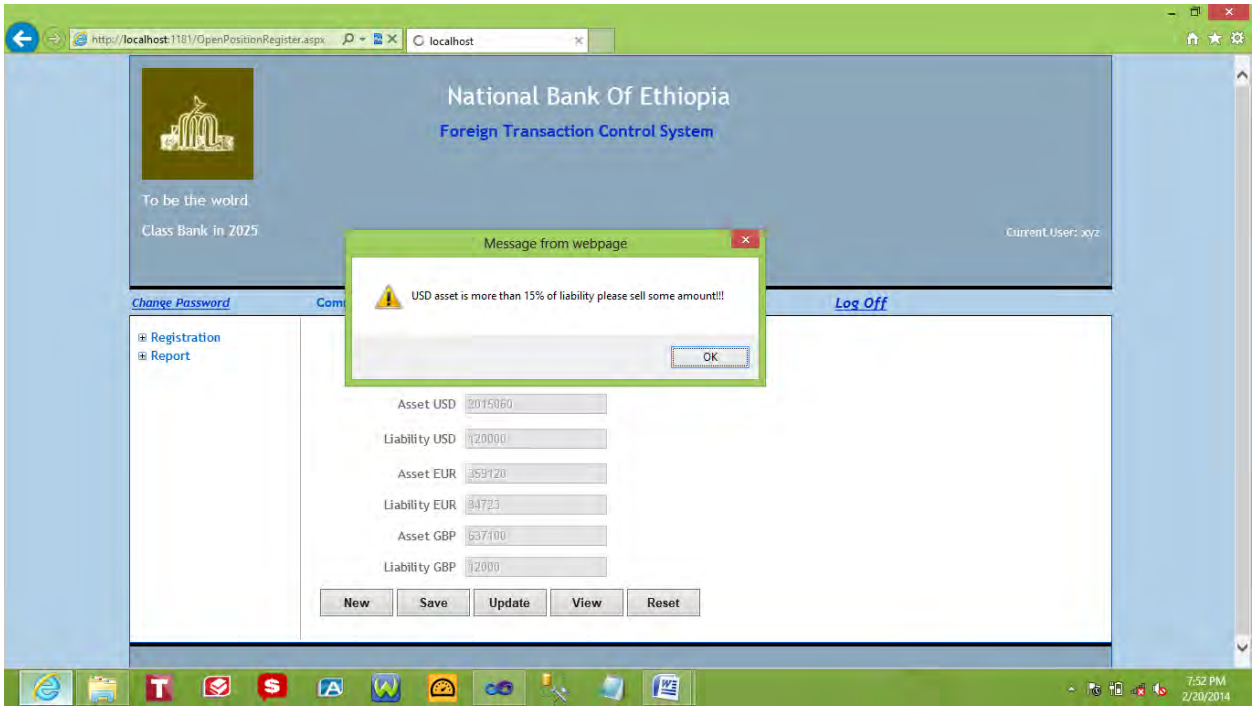

Figure 5.8: Open Position notification message

Cash Transaction Registration form is used to register commercial banks cash transaction as shown in Figure 5.9. Transaction ID will be automatically generated by the system and after successfully registration the bank asset will be updated as the currency and type of transaction. If

the commercial bank bought a foreign currency the asset of the bank for the bought currency will be increased or if it is sell the asset will be reduced.

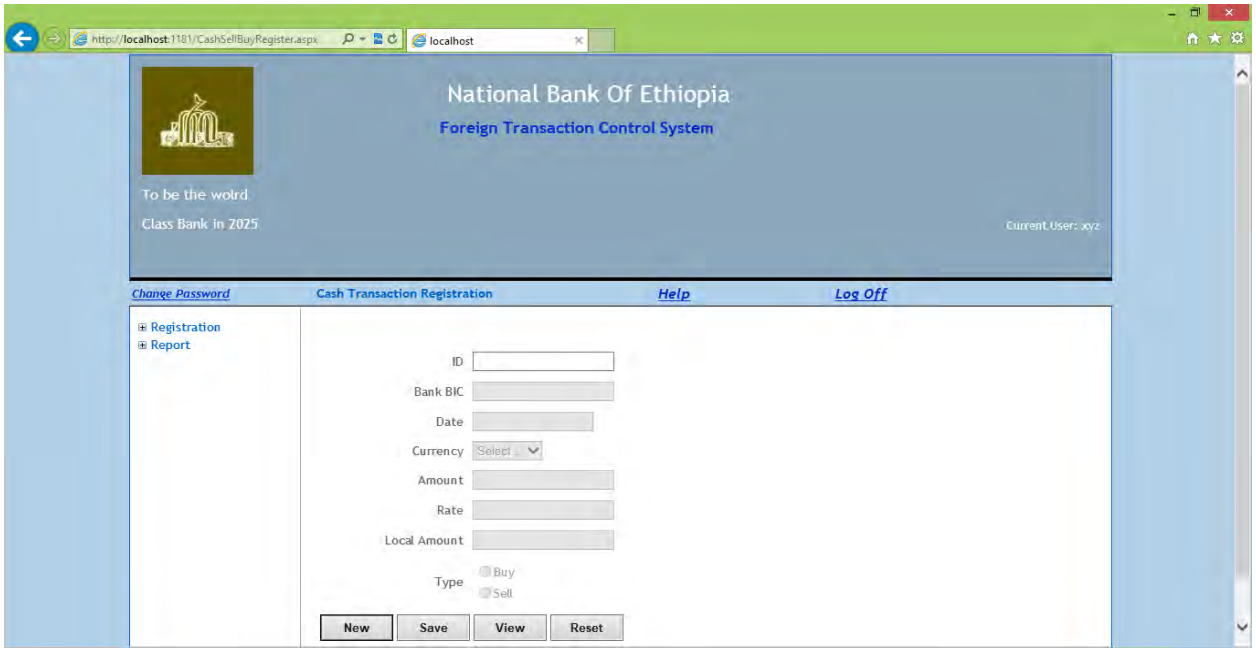

Figure 5.9: Register Cash Transaction Form

The daily exchange rate for each currency can be inserted, updated, deleted or viewed in Register Foreign Exchange Rate form as shown in Figure 5.10. When the NBE officers insert or update the rate commercial banks can view and use the foreign exchange rate.

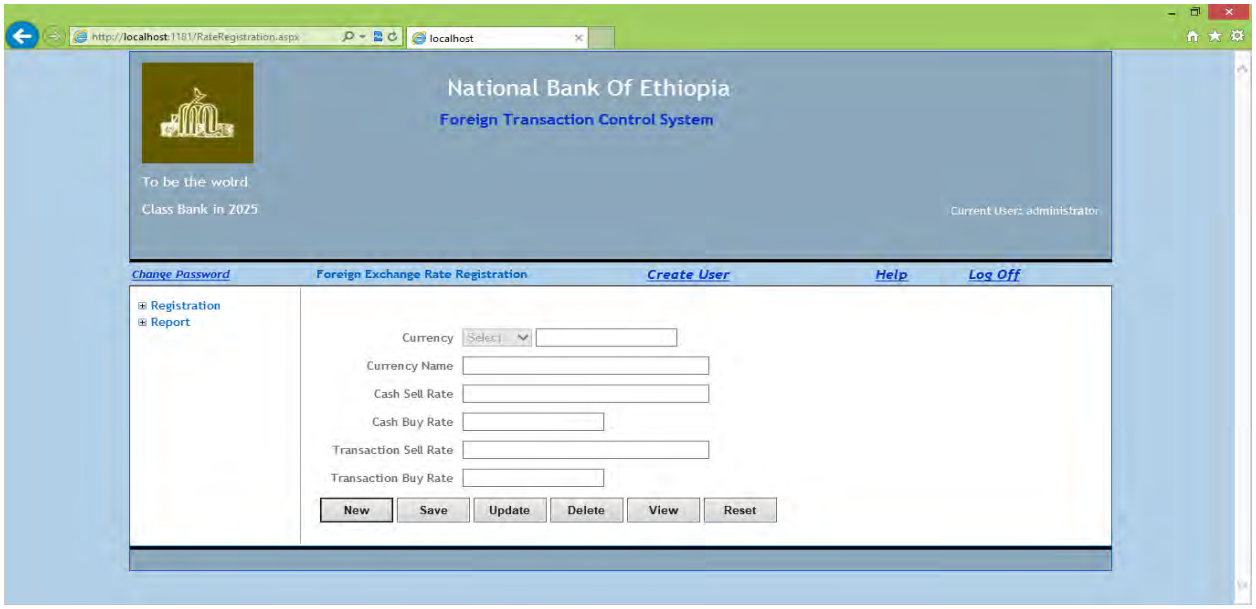

Figure 5.10: Register foreign Exchange Rate form

The form Register issued import permit as shown in figure 5.11 is used to insert and view the commercial bank issued import transaction. After successful registration of the transaction the system will update the bank open position, which is increasing the liability of the bank by the transaction currency.

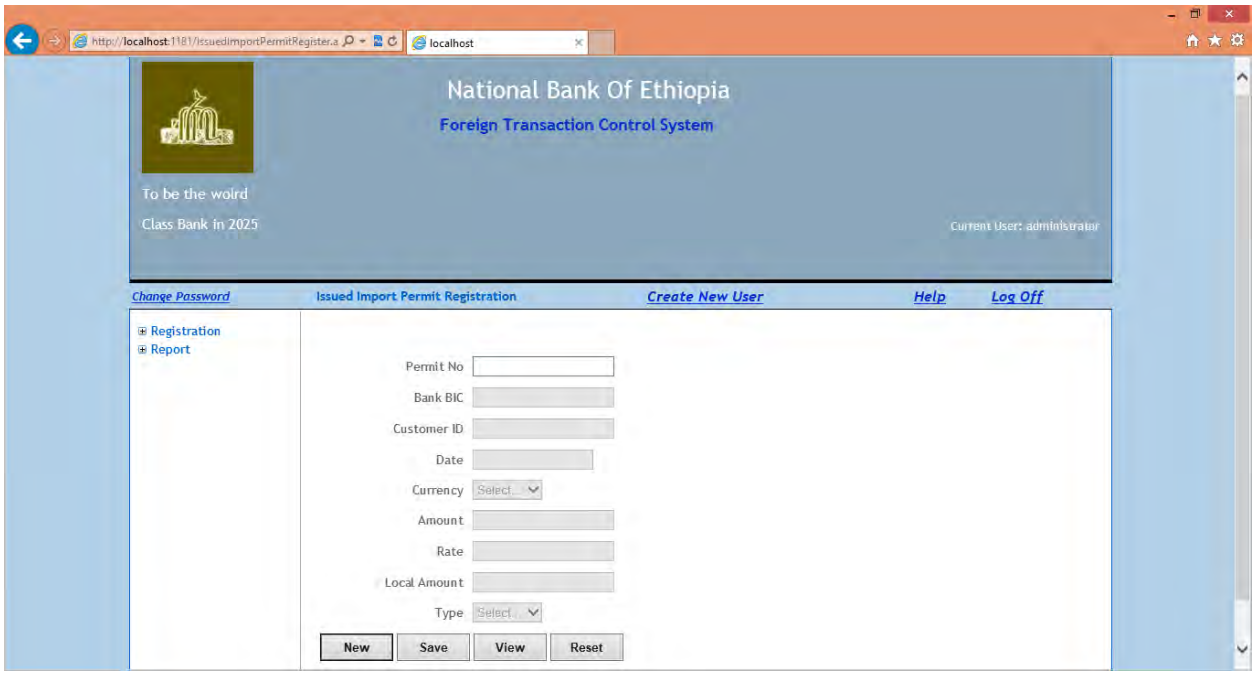

Figure 5.11: Register Issued Import Permit Form

The form Register Utilized import permit as shown in figure 5.12 is used to insert and view the commercial bank utilized import transaction. After successful registration of the transaction the system will update the bank open position, which is decreasing both liability and asset of the bank by the transaction currency.

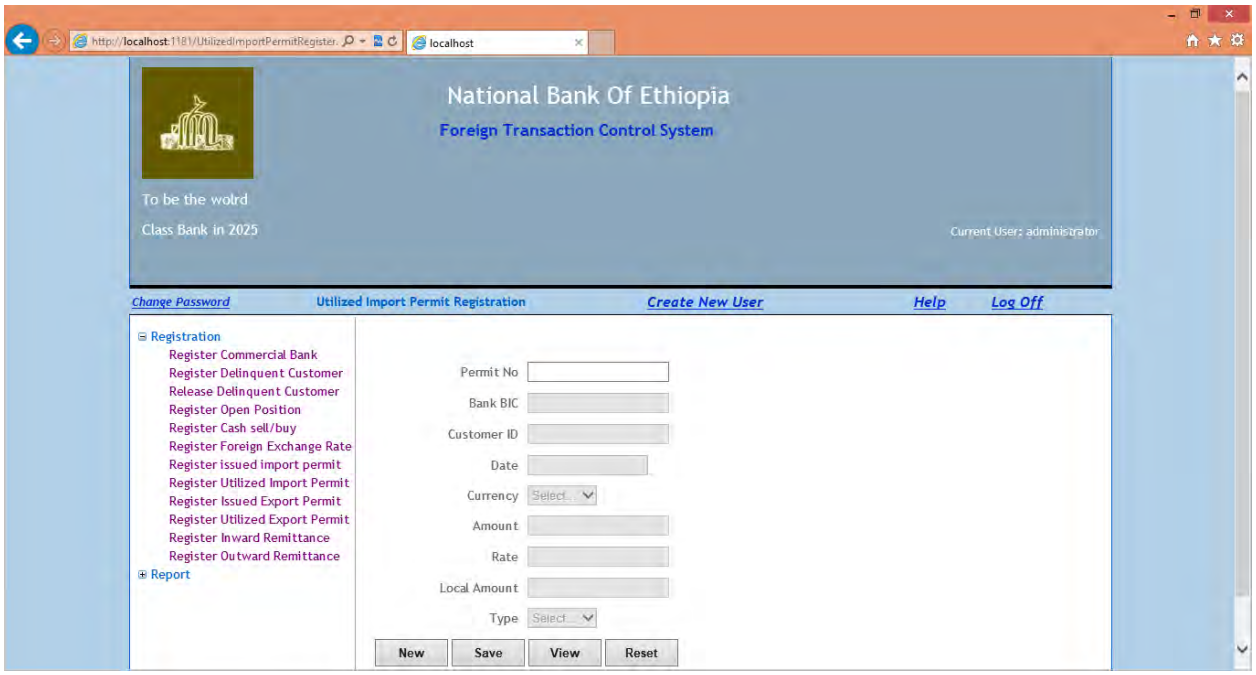

Figure 5.12: Register Utilized Import Permit Form

The form Register issued export permit as shown in figure 5.13 is used to insert and view the commercial bank issued export transaction.

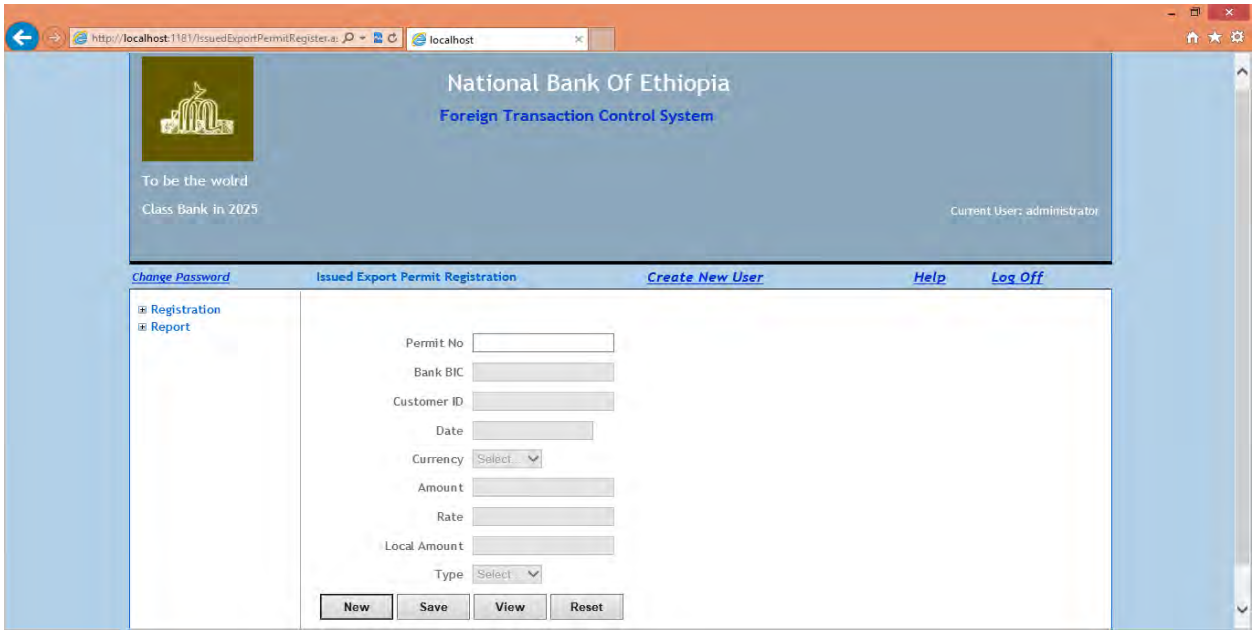

Figure 5.13: Register Issued Export Permit Form

The form Register utilized export permit as shown in figure 5.14 is used to insert and view the commercial bank utilized exports transaction. After successful registration of the transaction the system will update the bank open position, which is increasing the asset of the bank by the transaction currency.

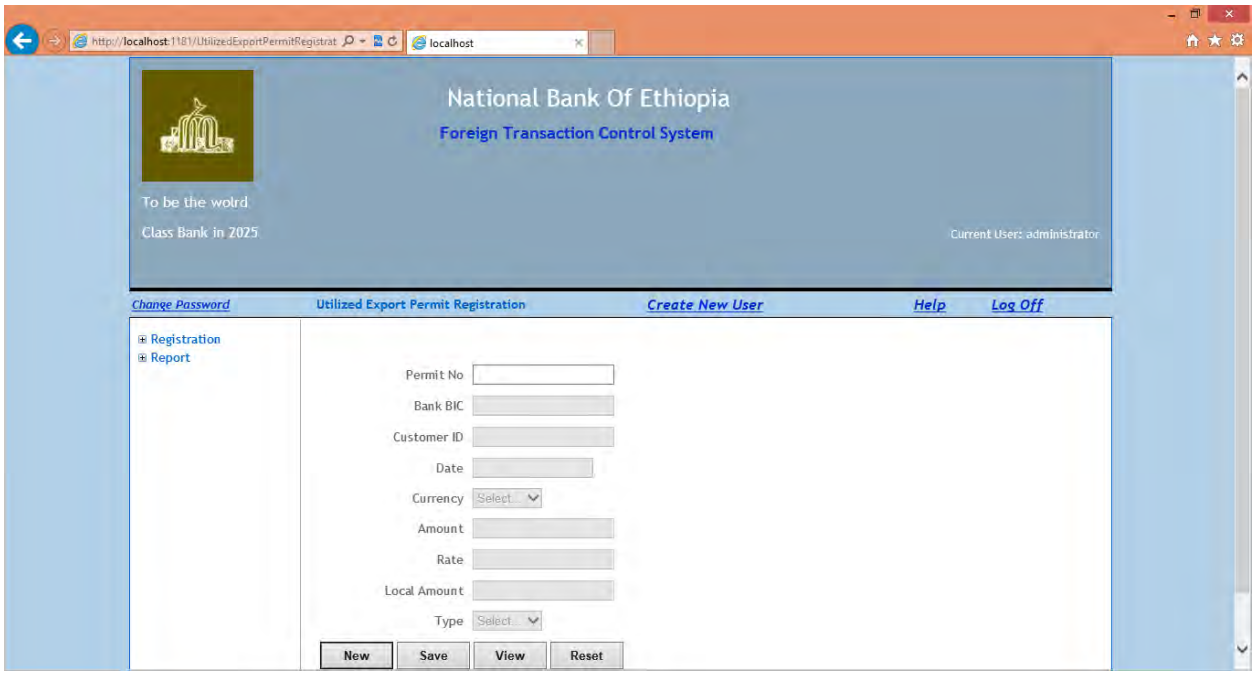

Figure 5.14: Register Utilized Export Permit Form

The form Register Inward Remittance as shown in figure 5.15 is used to insert and view the commercial bank inward remittance. After successful registration of the transaction the system will update the bank open position, which is increasing the asset of the bank by the transaction currency.

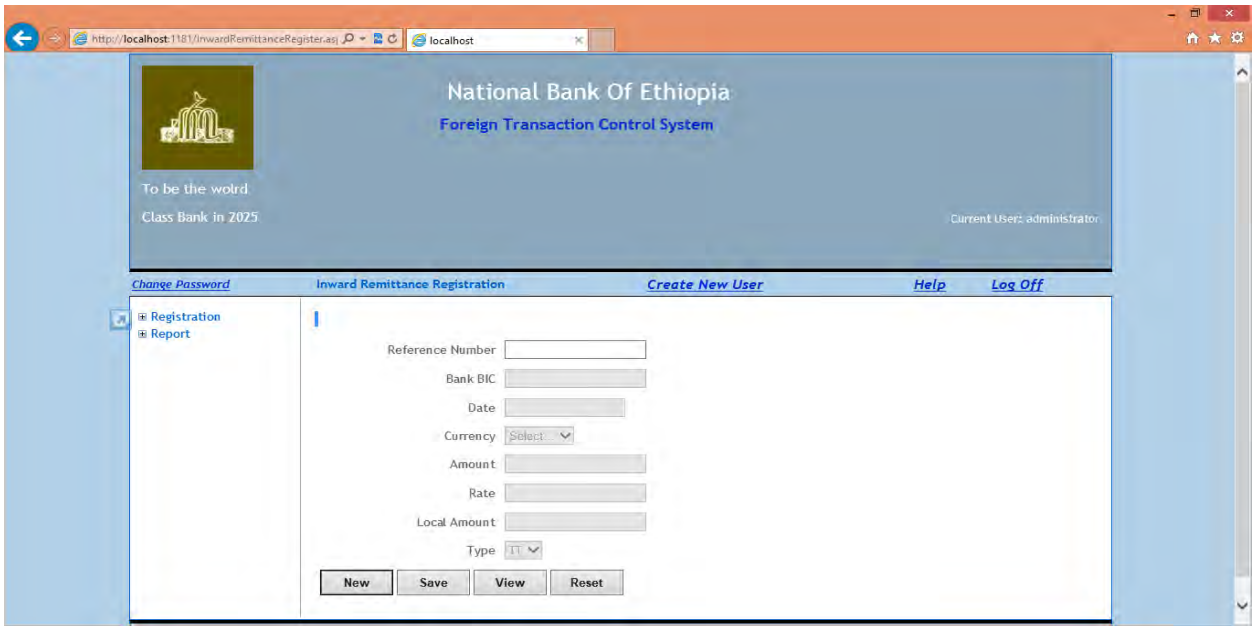

Figure 5.15: Register Inward Remittance Form

The form Register Outward Remittance as shown in figure 5.16 is used to insert and view the commercial bank outward remittance. After successful registration of the transaction the system will update the bank open position, which is decreasing the asset of the bank by the transaction currency.

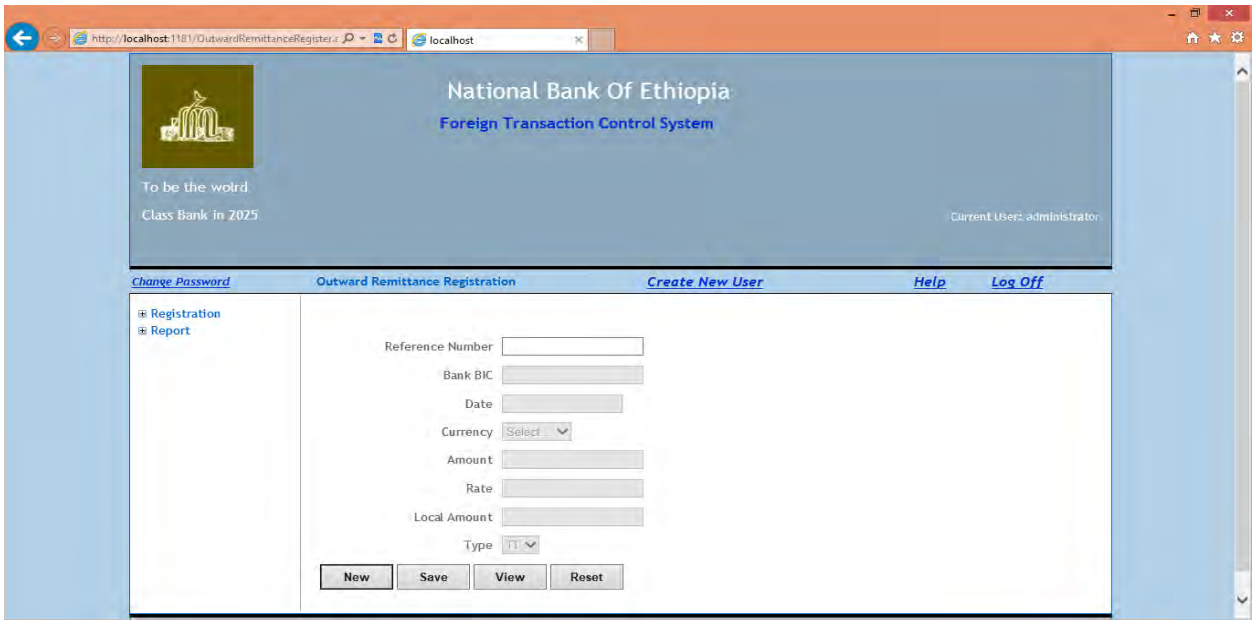

Figure 5.16: Register Outward Remittance Form

5.2.3 Reporting

This component is designed to generate different reports, Screenshots for some of the reports is shown in Figures 5.17-5.25.

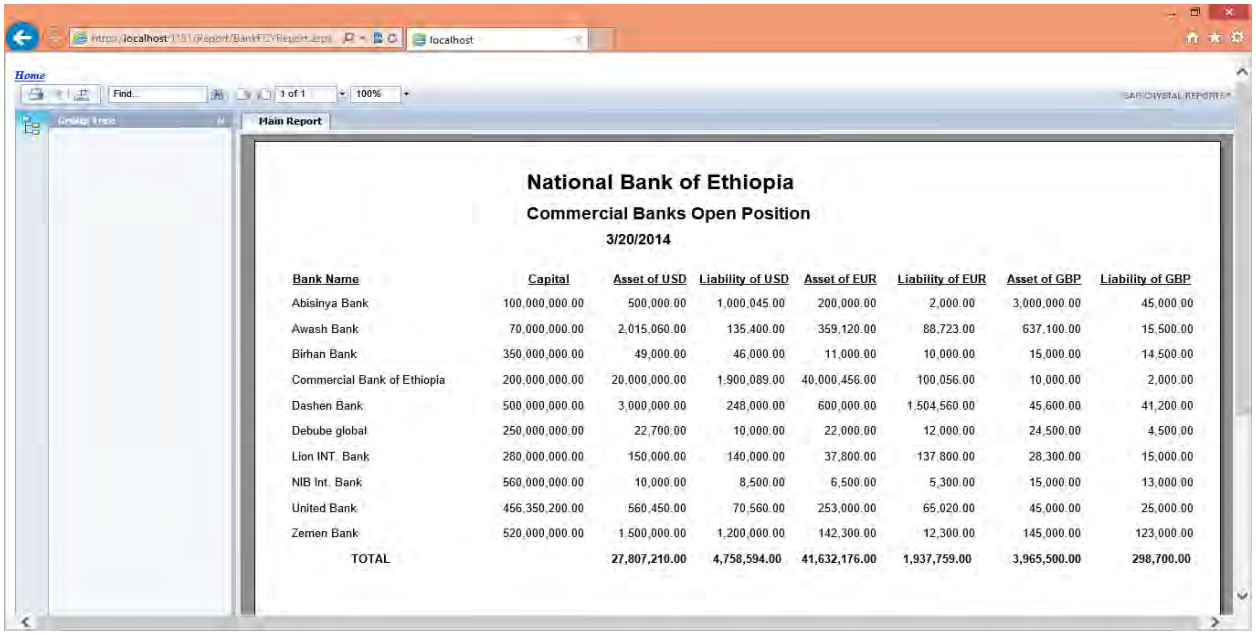

Figure 5.17: Commercial Bank Open Position Report

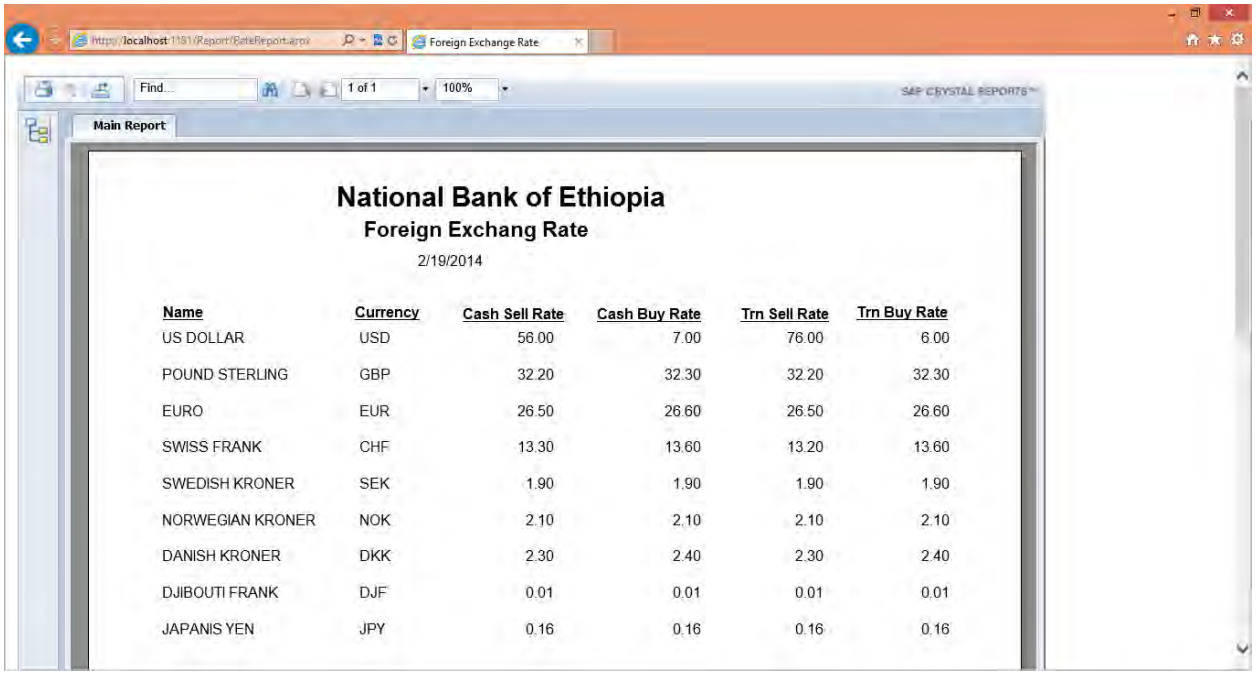

Figure 5.18: Foreign Exchange Rate Report

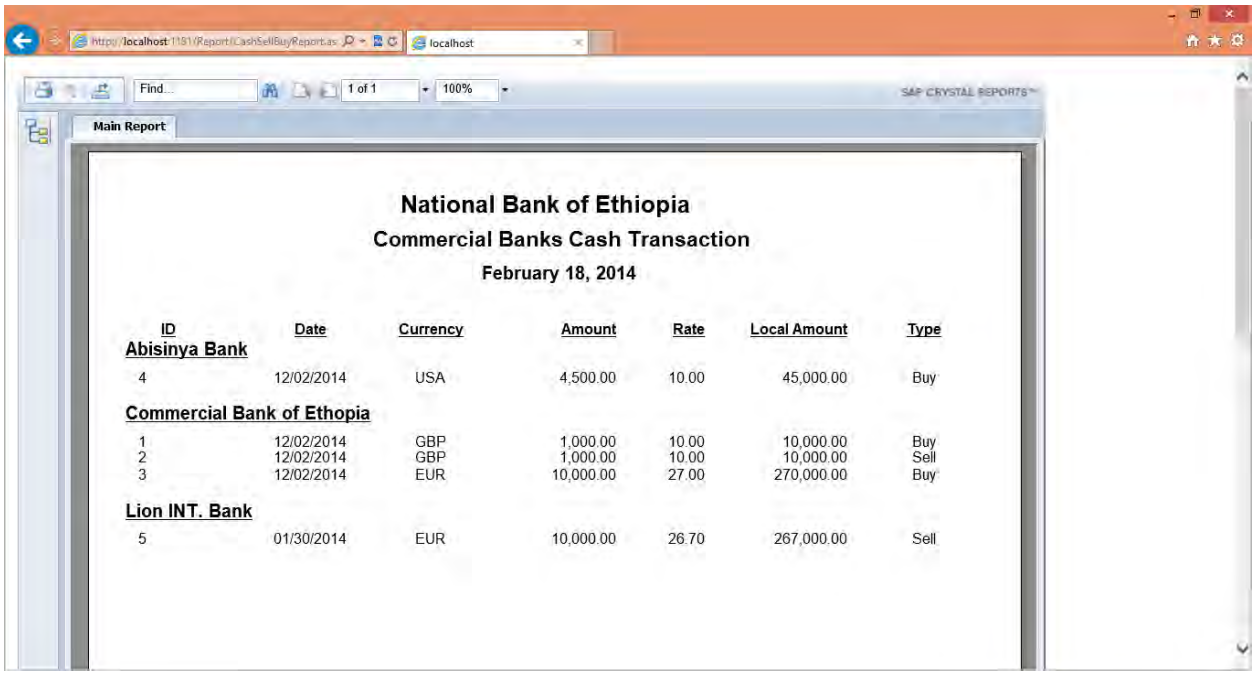

Figure 5.19: Commercial Banks Cash Transaction Report

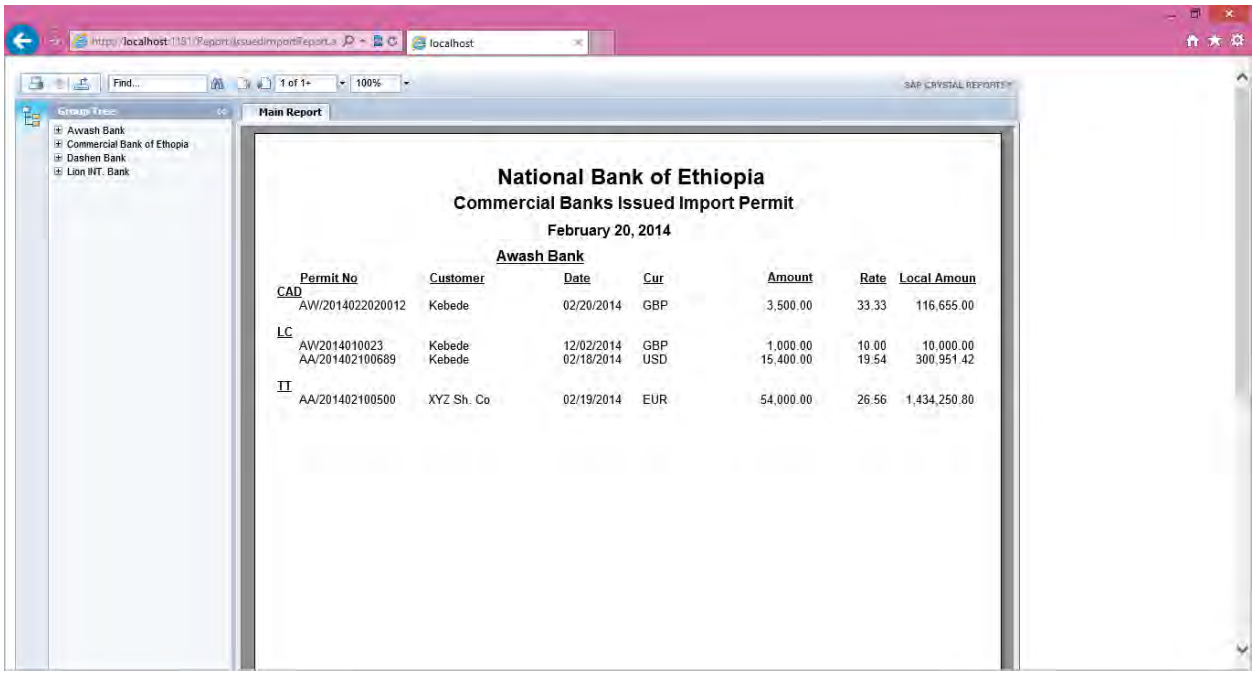

Figure 5.20: Commercial Banks Issued Import Permit Report

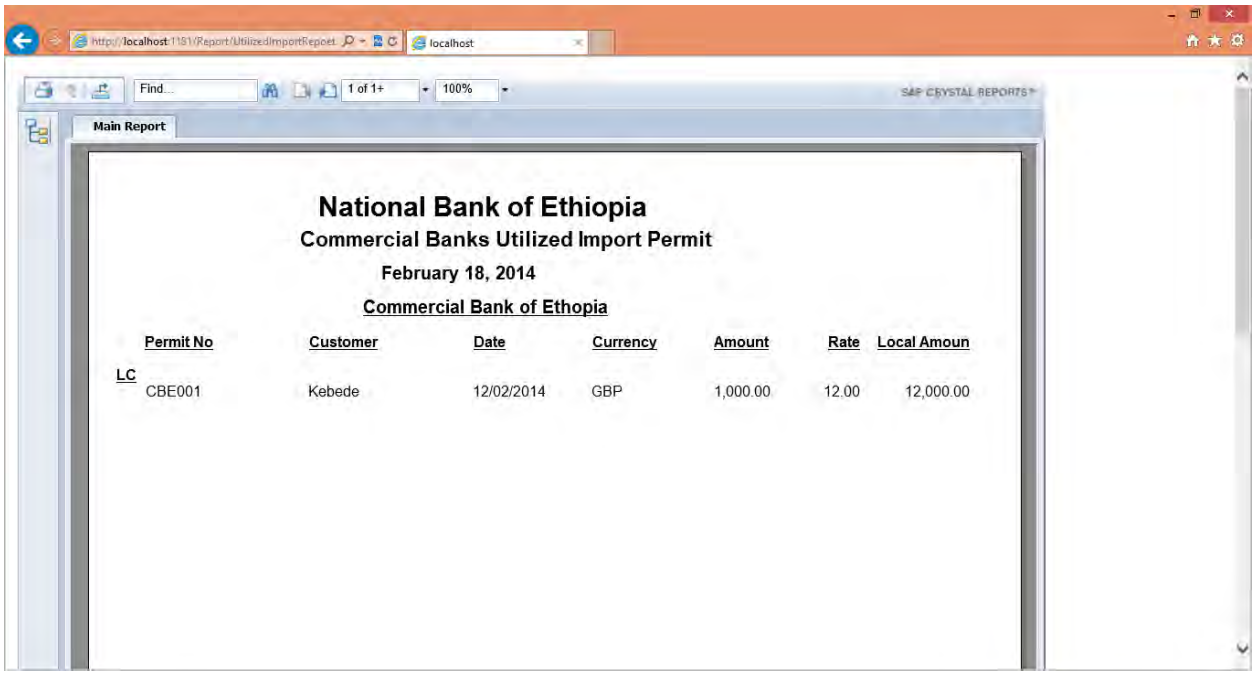

Figure 5.21: Commercial Banks Utilized Import Permit Report

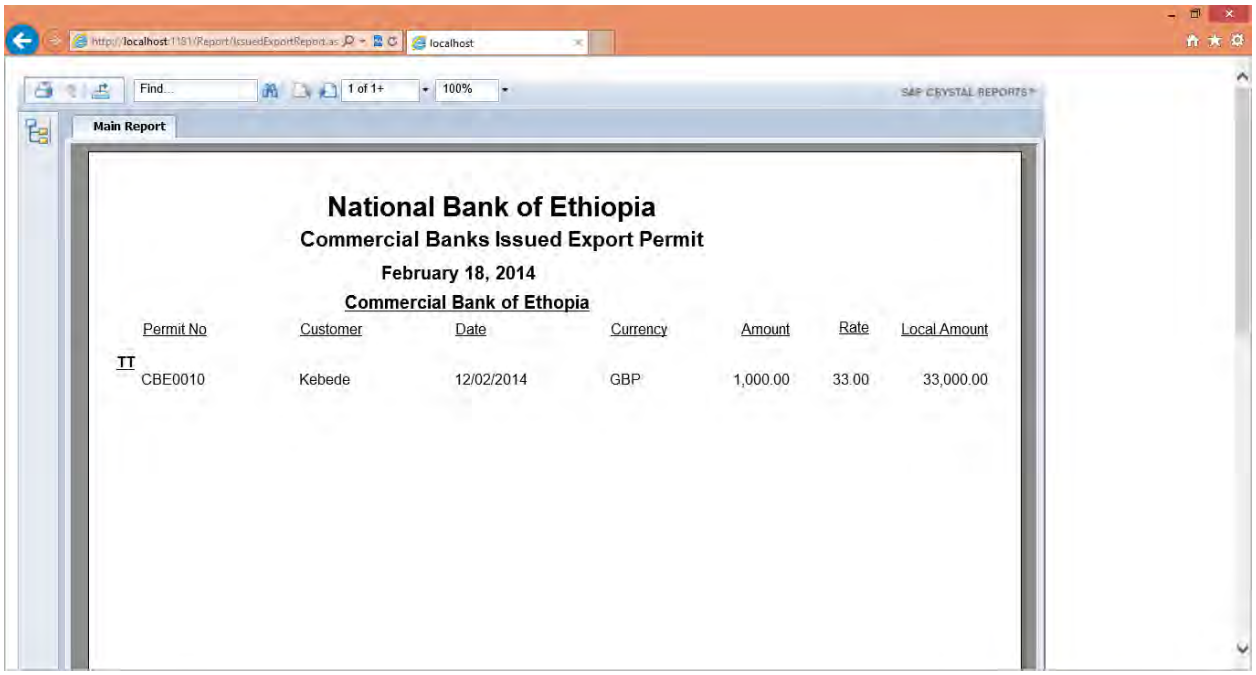

Figure 5.22: Commercial Banks Issued Export Permit Report

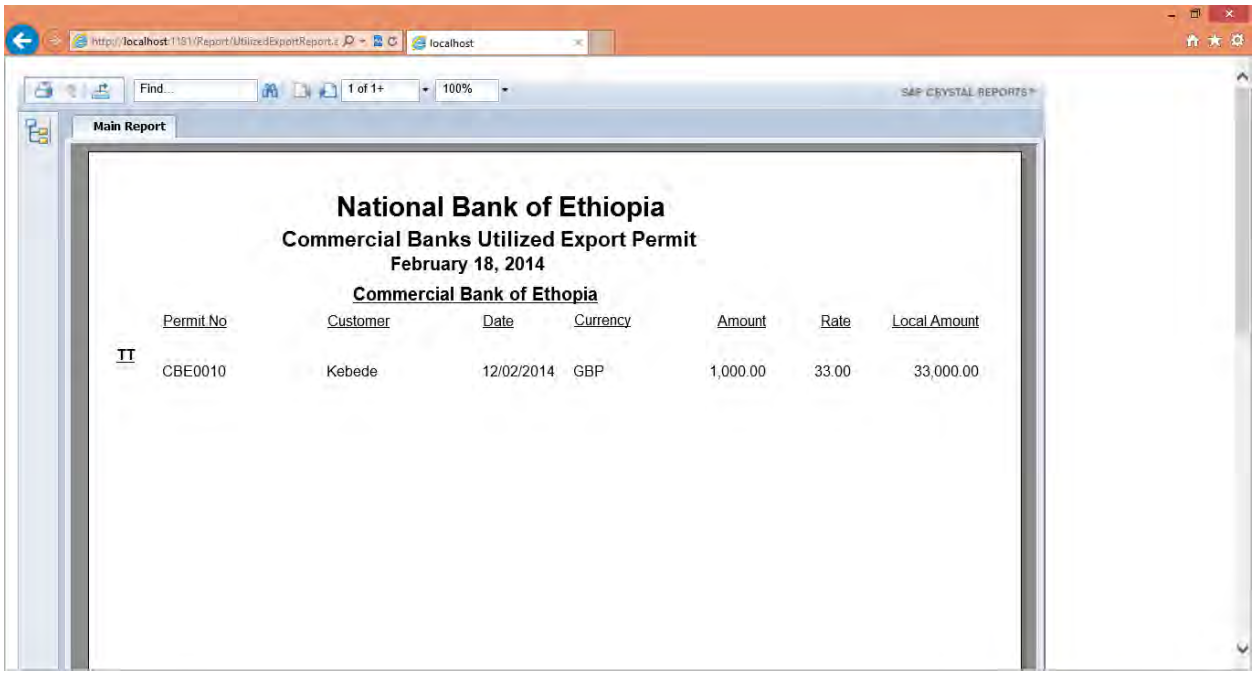

Figure 5.23: Commercial Banks Utilized Export Permit Report

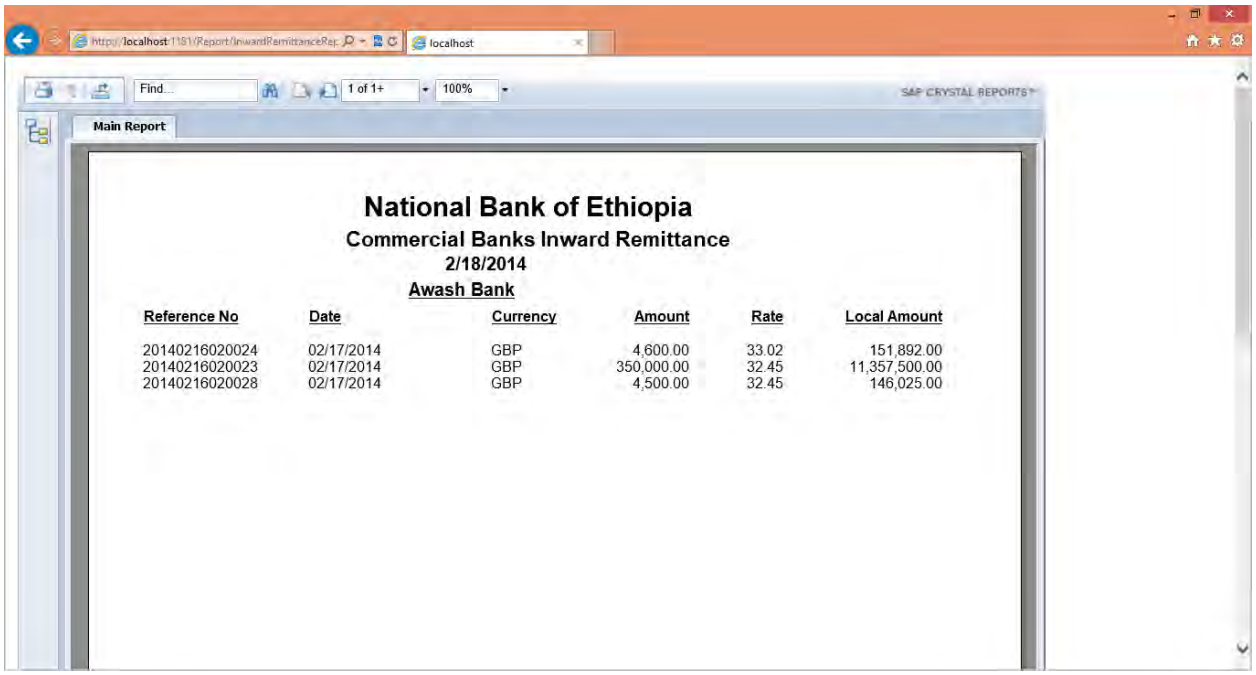

Figure 5.24: Commercial Banks Inward Remittance Report

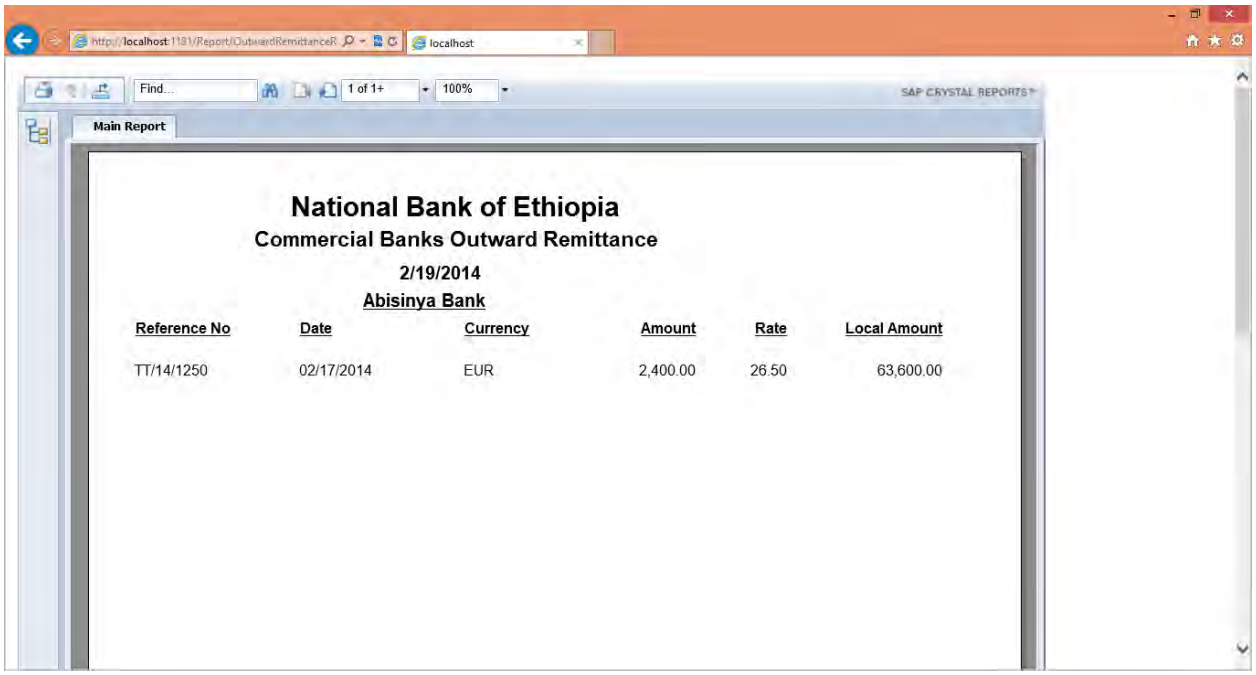

Figure 5.25: Commercial Banks Outward Remittance Report

5.3 Usability Testing

The user acceptance test for the system has been conducted with NBE and Commercial bank users. Criteria's has been identified from the functional requirement of the system. In the system evaluation, 3 users from commercial bank and 5 users from NBE were participated in the testing. Before conducting the test the system was hosted on NBE local test environment to enable the users to test the system with actual data. In addition, user manual and system demonstration has been given to each user. Five level Likert scale (strongly agree (5), agree (4), neutral (3), disagree (2) and strictly disagree (1)) is used for the responses of the questions. The response of each user's category is given below Tables 5.1 – 5.2.

Table 5.1 Detailed questionnaire result of NBE users.

No.	Criteria	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean
1	Register new commercial bank	4	1	0	0	0	4.8
2	Register new delinquent customer	5	0	0	0	0	5
3	Release delinquent customer	3	2	0	0	0	4.6
4	Register cash transaction	4	1	0	0	0	4.8
5	Check for commercial bank open position	5	0	0	0	0	5
6	Check for delinquent customer	5	0	0	0	0	5
7	Updated commercial bank open position when cash transaction made	5	0	0	0	0	5
8	Register issued import permit	0	3	2	0	0	3.6
9	Register utilized import permit	0	3	2	0	0	3.6
10	Register issued export permit	0	3	2	0	0	3.6

11	Register utilized export permit	0	2	3	0	0	3.4
12	Register inward remittance	0	2	3	0	0	3.4
13	Register outward remittance	0	2	3	0	0	3.4
14	Updated commercial bank open position when foreign transaction made	5	0	0	0	0	5
15	Generate foreign exchange rate report	4	1	0	0	0	4.8
16	Generate commercial banks open position report	5	0	0	0	0	5
17	Generate commercial banks cash transaction report	5	0	0	0	0	5
18	Generate report for commercial banks issued import permit	5	0	0	0	0	5
19	Generate report for commercial banks utilized import permit	5	0	0	0	0	5
20	Generate report for commercial banks issued export permit	5	0	0	0	0	5
21	Generate report for commercial banks utilized export permit	5	0	0	0	0	5
22	Generate report for commercial banks inward remittance	5	0	0	0	0	5
23	Generate report for commercial banks outward remittance	5	0	0	0	0	5
Overall usability (%) : 91.3%							

Table 5.2 Detailed questionnaire result of Commercial bank users.

No.	Criteria	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean
1	Register cash transaction and open position	1	2	0	0	0	4.33
2	Check for delinquent customer	3	0	0	0	0	5
3	Updated commercial bank open position when cash transaction made	3	0	0	0	0	5
4	Register issued import permit	0	2	1	0	0	3.67
5	Register utilized import permit	0	2	1	0	0	3.67
6	Register issued export permit	1	2	0	0	0	4.33
7	Register utilized export permit	2	1	0	0	0	4.67
8	Register inward remittance	0	3	0	0	0	4
9	Register outward remittance	0	2	0	1	0	3.33
10	Updated commercial bank open position when foreign transaction made	3	0	0	0	0	5
11	Generate foreign exchange rate report	3	0	0	0	0	5
Overall usability (%) : 96%							

The test result of the system as shown above 91.3% is the result of the NBE users and 96% is the commercial bank users. The result of the evaluation has shown that the FTCS fulfills the customer requirement and also it is easy to use, save time of professionals and can go live to production.

Chapter Six Conclusion and Future Works

6.1 Conclusions

In a country like Ethiopia most of the goods that are used in the country is imported from abroad. Since the import of goods and services is more than the export of goods and services or the inward remittance, the country has a foreign currency shortage. To balance the import and export of goods and services, the National Bank of Ethiopia should follow and manage the country foreign exchange currency.

This system is developed to follow and manage the foreign exchange currency by developing a web based system that allow commercial banks to report the transaction to NBE as they make the import transactions, export transactions, outward remittance or inward remittance.

The prototype of this project has been tested with the data from commercial banks and NBE and it is achieved that the system successfully manages the registration, edition and deletion of banks, customers and transactions. Further, it also allows users to access information effectively.

6.2 Future Works

The future work for this project has to focus on connecting this system with the commercial banks core banking system. As the system allows users to register the foreign transactions individually for a bank like Commercial Bank of Ethiopia it will be easy if the transactions are automatically registered in this system.

Since most of the commercial banks have core banking systems it can be interfaced with this system to get the foreign transactions information.

This interface can be implemented as the existing system of EATS (Ethiopia Automated Transfer System) which is in progress in some banks to interface with some commercial banks core banking.

References

[1] NBE Foreign Exchange Directives, 2004.

[2] Management of Foreign Exchange Reserves at the Central Bank of Chile, 2011.

[3] Federal Negarit Gazeta of the Federal Democratic Republic of Ethiopia, 2M008.

[4]http://www.businessdictionary.com/definition/foreign-exchange-rate.html [accessed December 6, 2013]

[5]http://www.investopedia.com/terms/e/exchangerate.asp#axzz2FO7uHBuK [accessed December 6, 2013]

[6] European central bank risk management for central bank foreign reserves, C. Bernadell, P. Cardon, J. Coche, F. X. Diebold and S. Manganelli, 2004.

[7] Central bank of the republic of turkey, the real exchange rate definitions and calculations, A. N. Kipici, M. Kesriyeli, 1997.

[8] Management of Foreign Exchange Reserves at the Central Bank of Chile, 2011.

[9] The Federal Democratic Republic of Ethiopia: Article IV Consultation—Staff Report; Public Information Notice on the Executive Board Discussion; Staff Statement; and Statement by the Executive Director for Ethiopia, 2012.

[10] National bank of Ethiopia licensing and supervision of banking business Customer Due Diligence of Banks Directives No. SBB/46/2010.

[11] A Guide to Foreign Exchange Transactions, Exchange Control Department Central Bank of Sri Lanka, 2008.

[12]http://www.earnforex.com/articles/use-of-fx-controls-promote-economical-stability#_edn2, [accessed December 4, 2013]

[13] Bank Risk Management Guidelines (Revised) National Bank of Ethiopia, 2010.

[14], Object-Oriented Analysis and Design with Applications, Grady Booch, 1991.

[15] Object-Oriented Software Engineering Bernd Bruegge & Allen H. Dutoit, 1999.

Annex: A
Existing system forms

Issued Permit Import Form

NAME OF COMMERCIAL BANK
IMPORT APPLICATION PAYMENT
FOR THE WEEK ENDED FROM TO
REPORTING DATE

DATE	PERMIT NO.	NO. OF APPLICATIONS	TYPE OF CURR.	CANCEL FCY	UTILIZED AMOUNT IN F/CY	RATE	BIRR EQUIVALENT	REMARK
	TOTAL			-	-		-	

AUTHORIZED SIGNATURE: _____

Issued Export Permit Form

NAME OF COMMERCIAL BANK
EXPORT APPLICATION PROCESSED
FOR THE WEEK ENDED FROM TO

REPORTING DATE:

Date	Permit No.	No. of Application	Currency	Amount in FCY	Rate	Birr Equivalent	Remark
		0		-		-	

AUTHORIZED SIGNATURE: _____

Utilized Import Permit Form

NAME OF COMMERCIAL BANK							
IMPORT APPLICATION PROCESS FOR THE WEEK ENDED FROM TO							
REPORTING DATE							
DATE	PERMIT NO.	NO. OF APPLICATIONS	TYPE OF CURR.	UTILIZED AMOUNT IN FCY	RATE	BIRR EQUIVALENT	REMARK
	TOTAL			-		-	

AUTHORIZED SIGNATURE: _____

Annex: B

Sequence Diagram

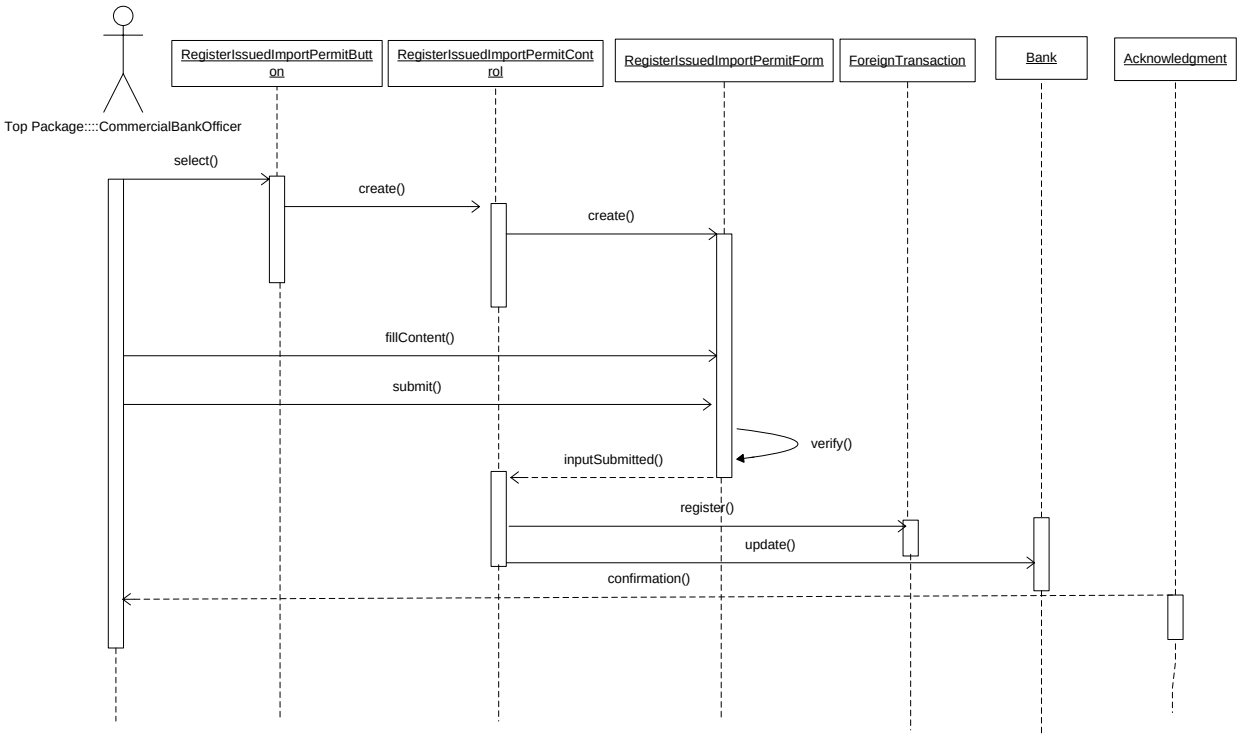

Figure B.1: Sequence Diagram for registering issued import permit

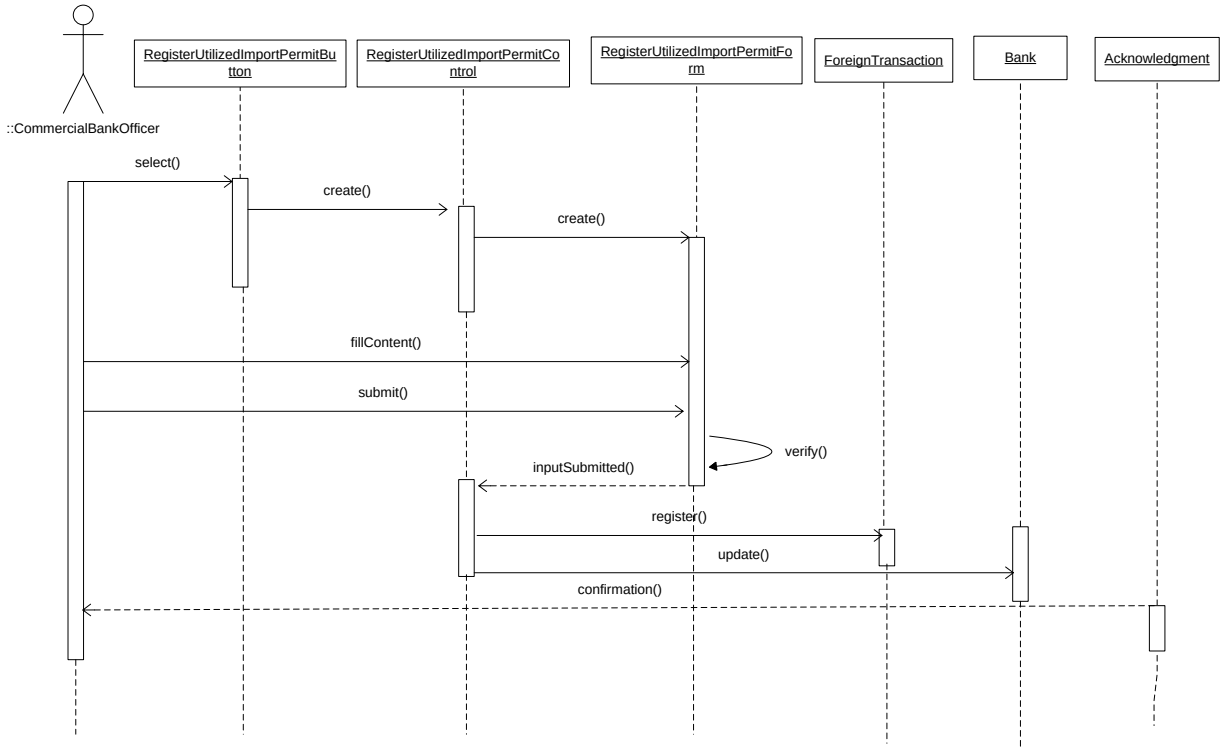

Figure B.2: Sequence Diagram for registering utilized import permit

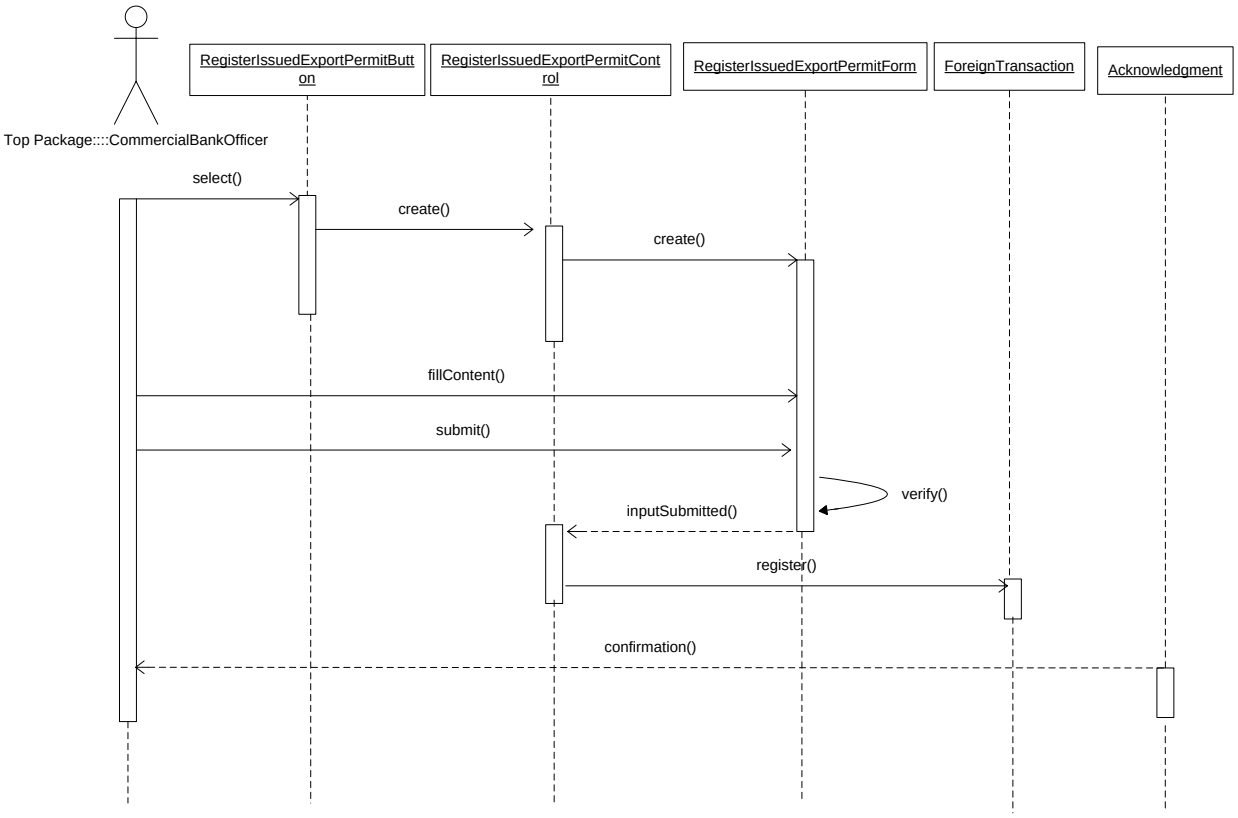

Figure B.3: Sequence Diagram for registering issued export permit

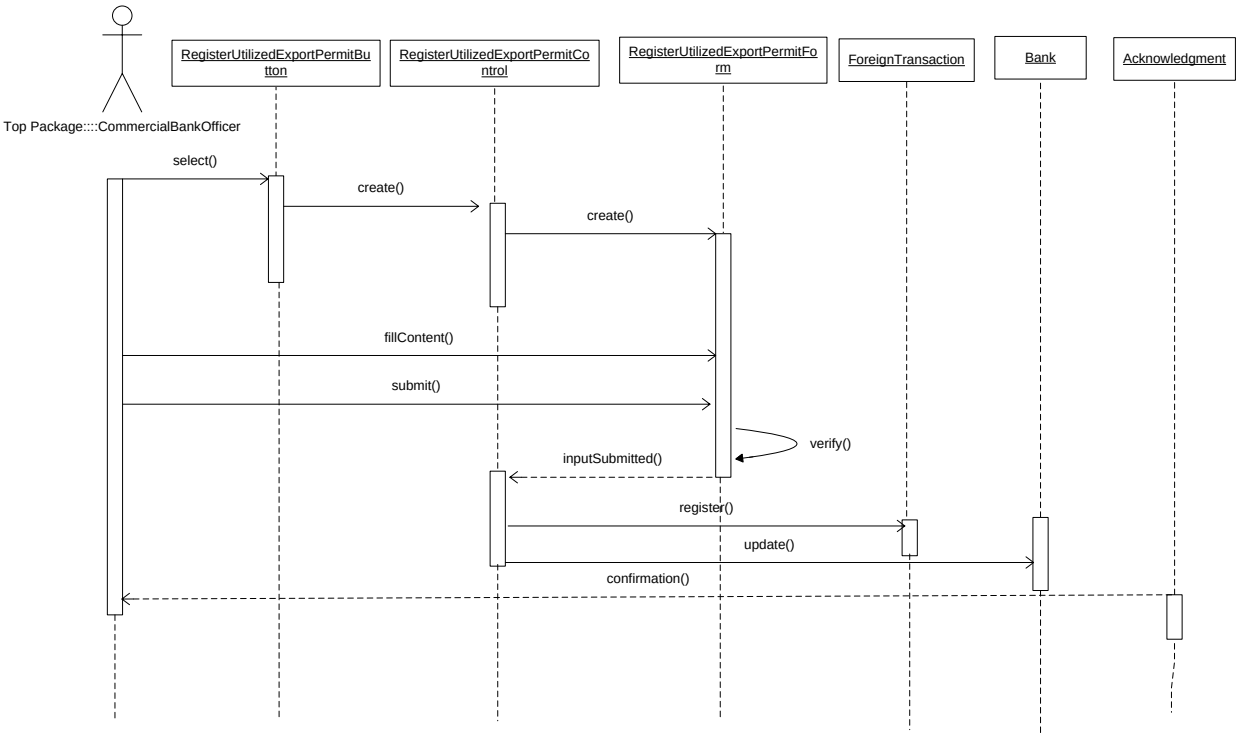

Figure B.4: Sequence Diagram for registering utilized export permit

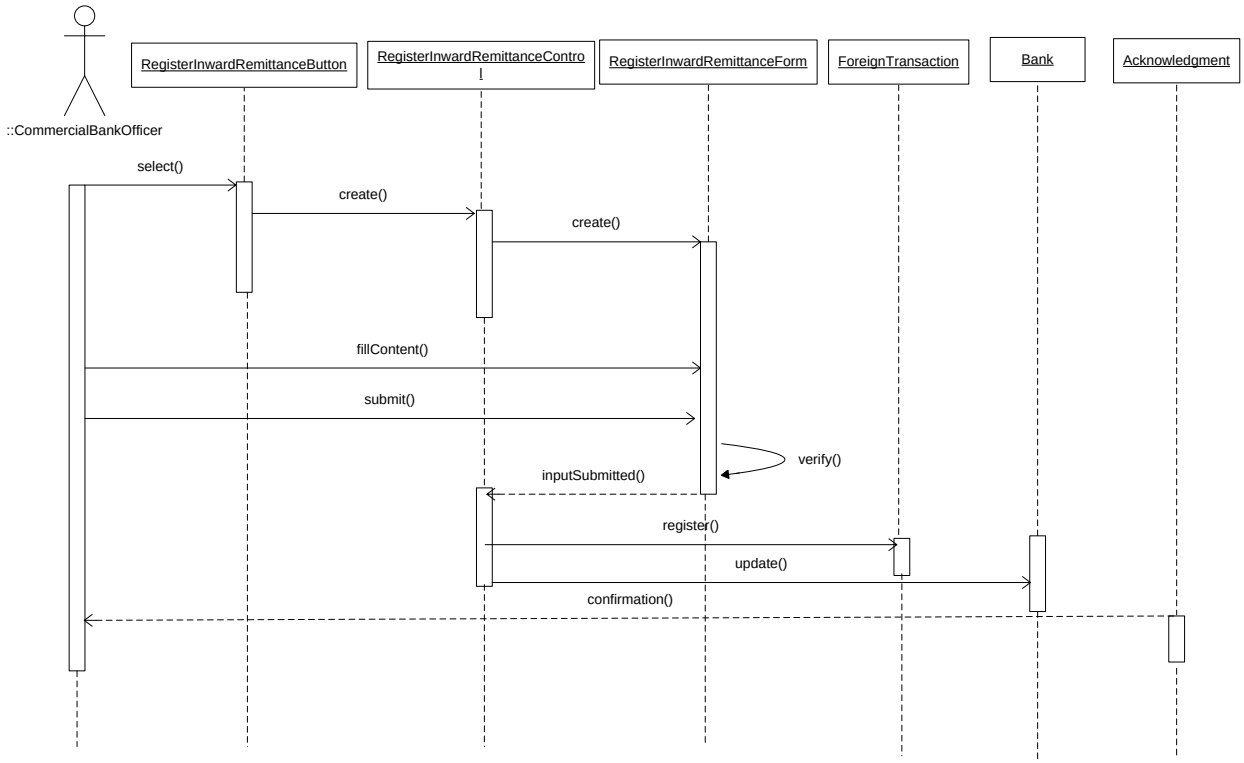

Figure B.5: Sequence Diagram for registering inward remittance

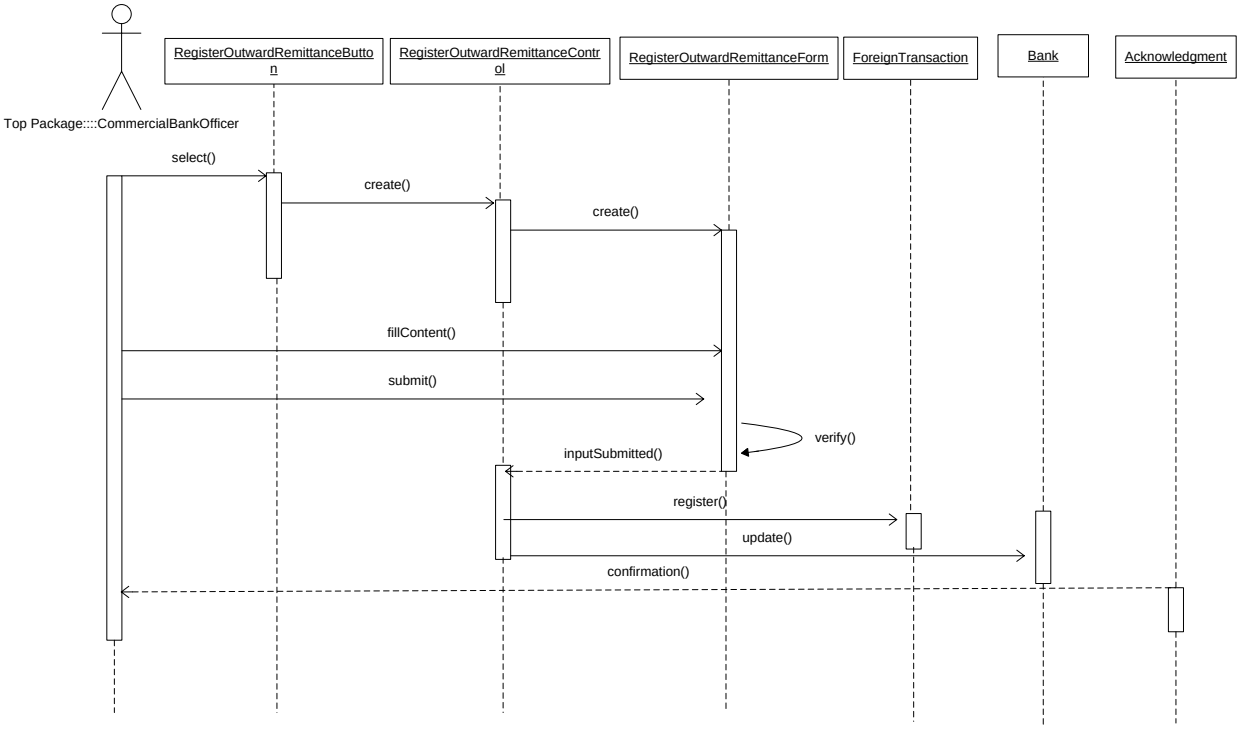

Figure B.6: Sequence Diagram for registering outward remittance

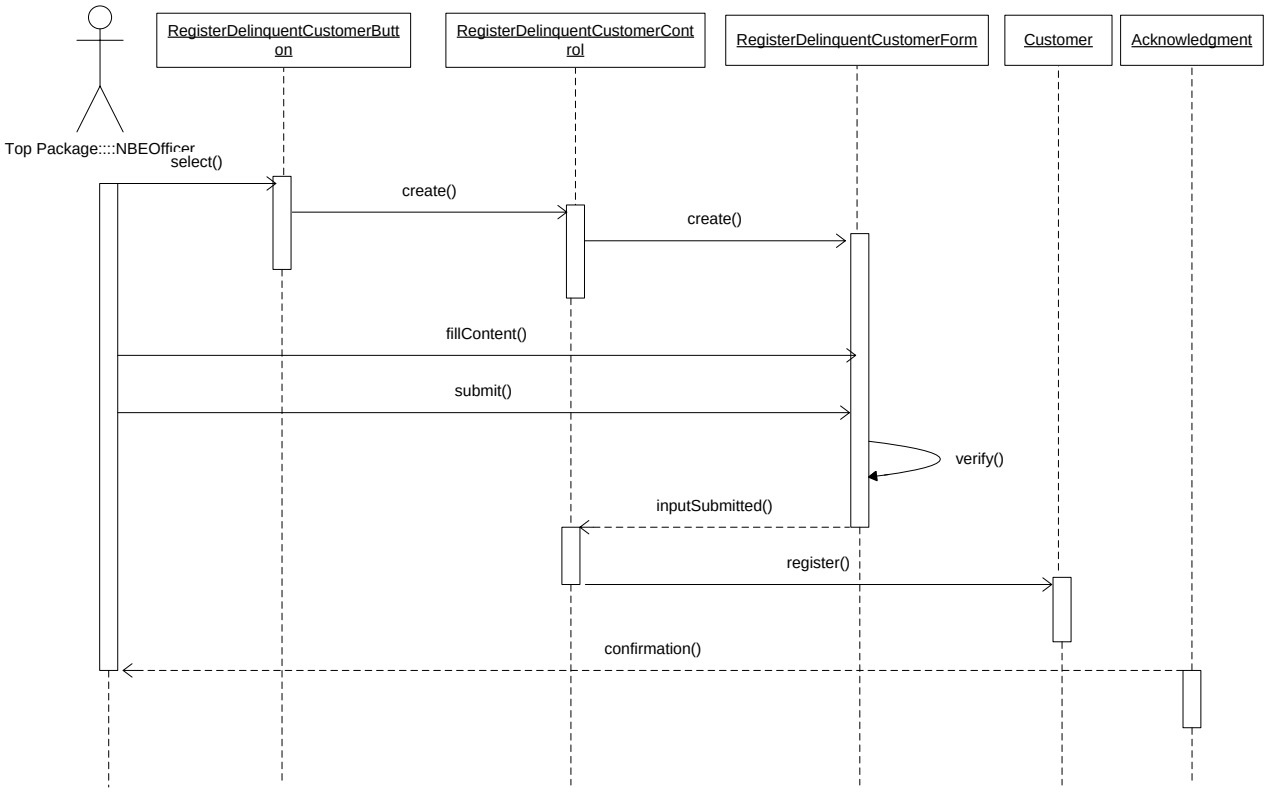

Figure B.7: Sequence Diagram for registering delinquent customer

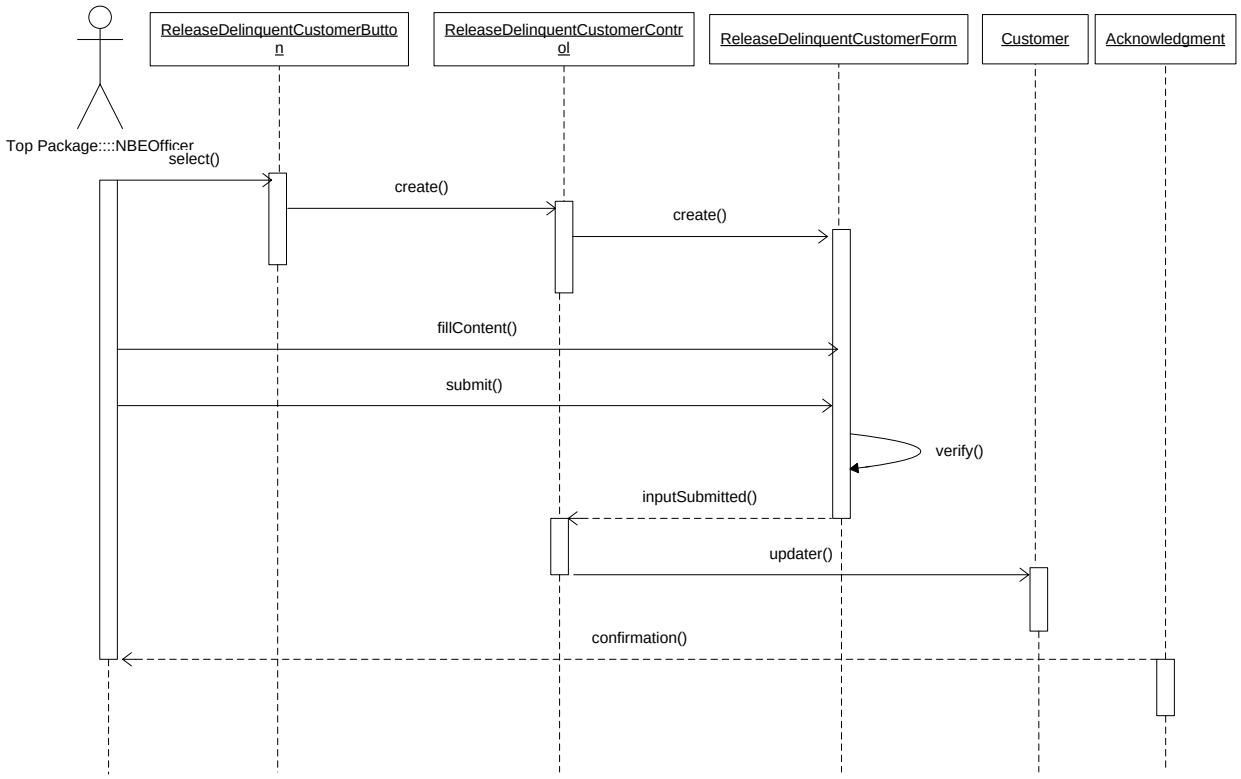

Figure B.8: Sequence Diagram for releasing delinquent customer

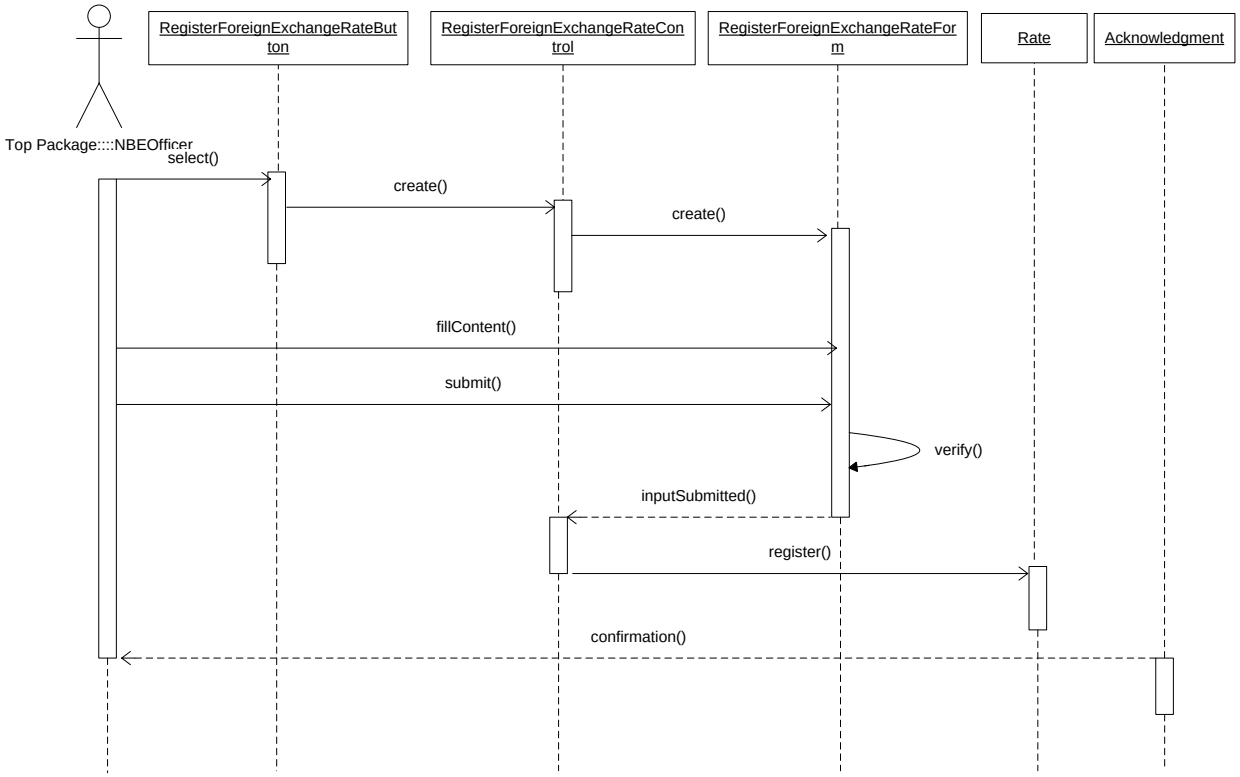

Figure B.9: Sequence Diagram for registering foreign exchange rate

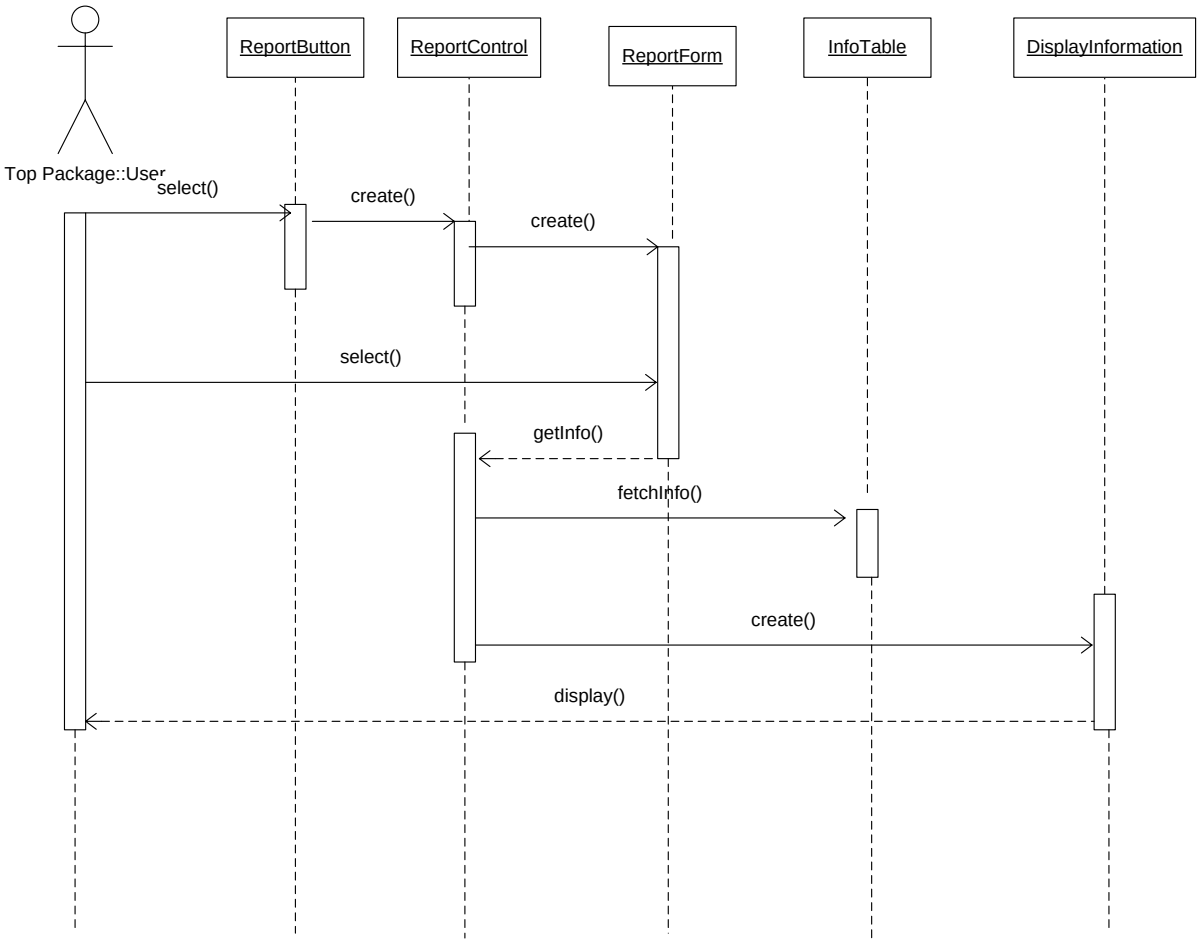

Figure B.10: Sequence Diagram for generating report

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of materials for the thesis have been duly acknowledged.

_____

Helen Asamnew

This thesis has been submitted for examination with my approval as an advisor.

_____

Mulugeta Libse (PhD)

Addis Ababa, Ethiopia

March, 2014