Concordia University

SOEN-6481 SOFTWARE SYSTEMS REQUIREMENTS SPECIFICATION(FALL 2019)

TICKET VENDING MACHINE

DELIVERABLE 1 (D1)

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GitHub - https://github.com/m3hrn4z/SRS
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Deliverable - 1

1.1 Problem 1

1.1.1 iGo Description

The product iGo is a software solution for TVM (Ticket Vending Machine) which allows user to purchase tickets, recharge their OPUS card and get information about the different tickets Société de transport de Montréal (STM)(Société de transport de Montréal) offers. iGO products is designed to server people in Montreal, Quebec, Canada who use STM metros and buses. STM offers two ticketing methods: Rechargable Card OPUS Card and Non-Rechargable Card limited use cards. With OPUS card user can make unlimited trips in STM buses and metros for a particular period, which is the recharge cycle of the card.

User who wish recharge their OPUS card are first required to place their card in the card reader slot in TVM, they can then select the type of purchase they want to make and can select the mode of payment they wish to use. Currently, iGo supports cash and card payments. Users who want to purchase a Non-rechargable can select from a list of options based on the type of trip they wish to make. The purchase will be considered successfull only after the payment has been authenticated(in case of card payments) and is successfull. After a sucessfull purchase the user have the option to select the mode through which they wish to receive receipt. iGo supports 3 type of receipt delivery: Paper, email and SMS receipts.

iGo will also internally generate a Transaction when the user interacts with the system. The transaction is recorded irrespective of whether the purchase is successfull or not. These transactions helps track the purchase in case of any failure in the system. At bottom bar of the TVM display, a helpline number is displayed at all times in case user needs any kind of assistance.

1.1.2 Scope of Use

The product iGo at this moment is restricted to server in Montreal city only. iGo is a software system and does not include the development, maintenance or deployement of the physical devices needed to develop a TVM. iGo does not provide any online platform or device application to recharge OPUS card or purchase ticket.

1.2   Problem 2

1.2.1   Context of Use Model[4]: User

Factor	Description
User	
Role	User is the customer/passenger to purchase tickets
Experience	The experience depends on the how frequent the user is using the TVM, System is designed keeping in mind of a new user without any system knowledge
Education	System is designed assuming that customer can atleast read English. **CONSTRAINT:** We wont be able to design a model for who cant read
Physical Characteristics	The physical TVM should be designed in such a way that even the physically challenged customer with wheel chair should also access the TVM.
Cognitive Characteristics	The cognitive knowledge of a user should be counted as minimal, the system is designed keeping in mind of new user
Location	The location of user must be inside Montreal city.
Age	The system should offer Reduced Fare according to the user's age.
Profession	The system should offer reduced fares for students.
Special Variant Preferences in UI	For special need people with visual impairment system should offer voice messages.
Task	
Choice in system use	Number of tasks in the system should be divided individually, so that the user can choose the options such as purchasing for a single trip, buying a monthly pass etc
Complexity	Since the users can be with minimal knowledge on the TVM, tasks should be simple and straight forward
Demands	Available tasks should be able to satisfy user requirements with context of use. For example system should not issue more tickets that the number of passengers

Workflow Controllability	The workflow of each task in TVM machine should be easily controllable by the user. For example user should be able to navigate back to the main menu, user should be able to cancel the ticket selection or transaction etc.
Safety	The task payment should be made safer, in such a way that the card payment authentication is kept confidential. Even the user information if stored should be maintained confidential.
Criticality	Task criticality should be divided based on the how important the task is and how often it is used/reused.
Frequency	The TVM can be used any number of times by any number of users, so the TVM should be able to guide each user based on the current information available with respect to trains or buses.
Temporal Characteristics	According to user requests that are dependant to date, the system should validate the request based on current date.
Environment	
Physical Environment	The TVM will be placed in metro stations, the passengers will be able to buy ticket/passes before there journey in train/bus. The factors like lights on the TVM machine for the visibility, space available to access the TVM, is the place allocated is too noisy should be taken care.
Technical Environment	The TVM will be connected to the data server where the user informations can be retrieved, it will be connected to the bank server to authenticate the credit/debit cards.
Social Environment	The TVM must support at least two languages including English and French since the official language of Quebec is French.

1.2.2 Context of Use Model: Admin

Factor	Description
Admin	
Role	ADMIN **CONSTRAINT:** Due to the data privacy, The admin of TVM real activities were not available
Experience	The experience depends on the how frequent the admin is using the TVM, System is designed keeping in mind of a new admin without any system knowledge
Education	System is designed assuming that admin can atleast read English **CONSTRAINT: We wont be able to design a model for who cant read**
Physical Characteristics	The physical TVM should be designed in such a way that even the physically challenged admin with wheel chair should also access the TVM
Cognitive Characteristics	The cognitive knowledge of a admin should be counted as minimal, the system is designed keeping in mind of a new admin
Location	The location of admin must be inside Montreal city
Age	Ranging from 25-Retirement age
Profession	The Profession is Role of the admin
Special Variant Preferences in UI	For special need people with visual impairment system should offer voice messages
Task	
Choice in system use	Admin should be able to do all administrative activities such changing changing the ticket/monthly pass fares,changing discount offers. Or any User specific actions
Complexity	Since the admins can be with minimal knowledge on the TVM, tasks should be simple and straight forward
Demands	Should provide the TVM features in such a way, it should be easy for an admin change any relevant activity

Workflow Controllability	The workflow of each task in TVM machine should be easily controllable by the admin. For example admin should be able to navigate back to the main menu, admin should be able to any discount option, any membership or any user sepefic options
Safety	It should be confidential about the admin features. It should be isolated from the normal user login
Criticality	Task criticality should be divided based on the how important the task is and how often it is used/reused.
Frequency	The TVM can be used any number of times by any number of users, so the TVM should be able to guide each user based on the current information available with respect to trains or buses.
Temporal Characteristics	According to admin requests that are dependant to date, the system should validate the request based on current date
Environment	
Physical Environment	The TVM will be placed in metro stations, the passengers will be able to buy ticket/passes before there journey in train/bus. The factors like lights on the TVM machine for the visibility, space available to access the TVM, is the place allocated is too noisy should be taken care
Technical Environment	The TVM will be connected to the data server where the admin informations can be retrieved, it will be connected to the bank server to authenticate the credit/debit cards.
Social Environment	The TVM must support at least two languages including English and French since the official language of Quebec is French

1.2.3 Mind Map for TVM

The mind map[1] in the figure 1.1, is for the analysis of Metro TVM design. All the concepts which are required for the development have been mapped. The possible type of TVM users will give a high level idea of how the TVM should look like, and how can a TVM software designed to be operated. The Analysis is for the elicitation of requirements, which includes analysis of problem, action items, goals to achieve and solutions to the problems. The Design includes all level of designs during the TVM software development. Application of the TVM software designed will be for Metro transportation, requirement specific information should be acquired.
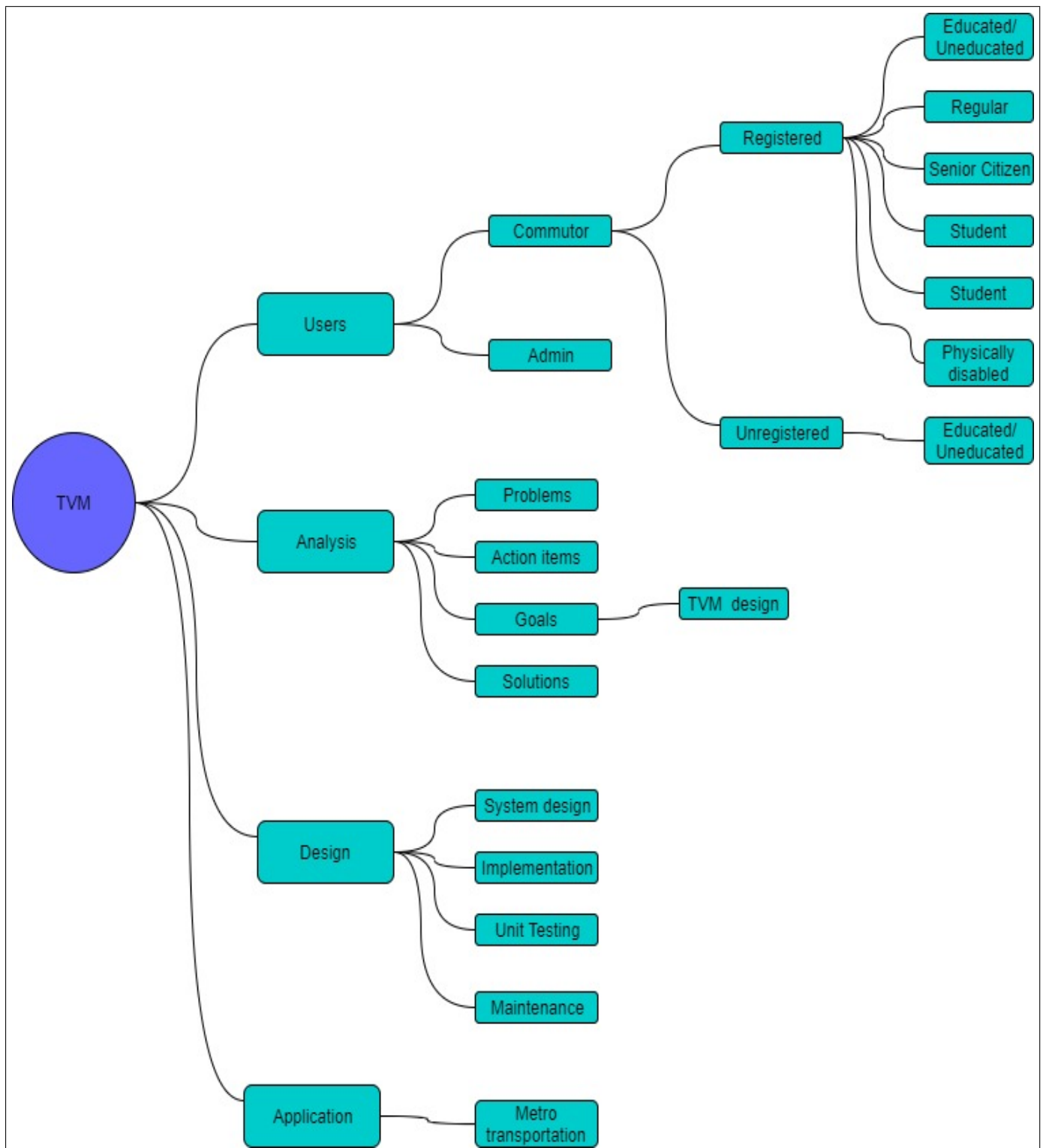
Figure 1.1: Mind Map

1.3 Problem 3

1.3.1 Domain Model[2]

Concepts	Description
TVM	It is a ticket vending machine to issue ticket or reload rechargeable card for bus and metro
User	Someone who uses TVM as a commuter, an administrator or a negative user as a crook
Administrator	Someone who has privilege to manage ticket specification
Crook	A negative user how tries to misuse the TVM like a hacker who is trying to steal bank car information
Commuter	Someone who comes to TVM and wants to buy ticket or check different fares to travel
Registered Commuter	Someone who has registered his/her information in the system and uses their Rechargeable Card to buy ticket
Unregistered Commuter	Someone who has not registered his/her information in the system and uses the system anonymously and buy Non-Rechargeable Ticket
Student	Someone who has the proof of being a student and is eligible to use reduced fare
Regular	Someone who has registered in the system and use Rechargeable Card, but pay Regular Fare
Senior Citizen	Someone who is 65 years old or over and is eligible to use reduced fare
Language	The display language of User Interface that can be either English or French
Printer	Printer is the device that prints the receipt or provides the non-rechargeable ticket
Receipt	It has the confirmation of the transaction and this is the superclass of different kinds of receipt

| Paper Receipt	It is a subclass of receipt which is printed on paper
Email	It is subclass of receipt electronically delivered to the user
Ticket	It is either a rechargeable or non-rechargeable ticket which users pay for to use metro or bus
Ticket Type	It describes number of trips or the duration (e.g. monthly ticket) of the ticket
Non-Rechargeable Ticket	It is a temporary ticket for limited use printed on the paper by printer
Rechargable Card	A card which has an expiry date and can be recharged and used multiple times before the expiration date
Fare	It includes the price of different plans to buy the ticket
Regular	It is regular price of a specific plan
Reduced	It is reduced price of a specific plan for special customers such as students or people with certain ages
Payment	It is superclass for different modes of payment
Bank Card	It is a payment method that uses bank card to pay for the ticket fare
Cash	It is a payment method that uses cash to pay for the ticket fare
Transaction	It debits customer bank card
Payment Authentication	It takes the details of the user's bank card and verify the payment with the bank server
Bank Server	It confirms user's bank card information
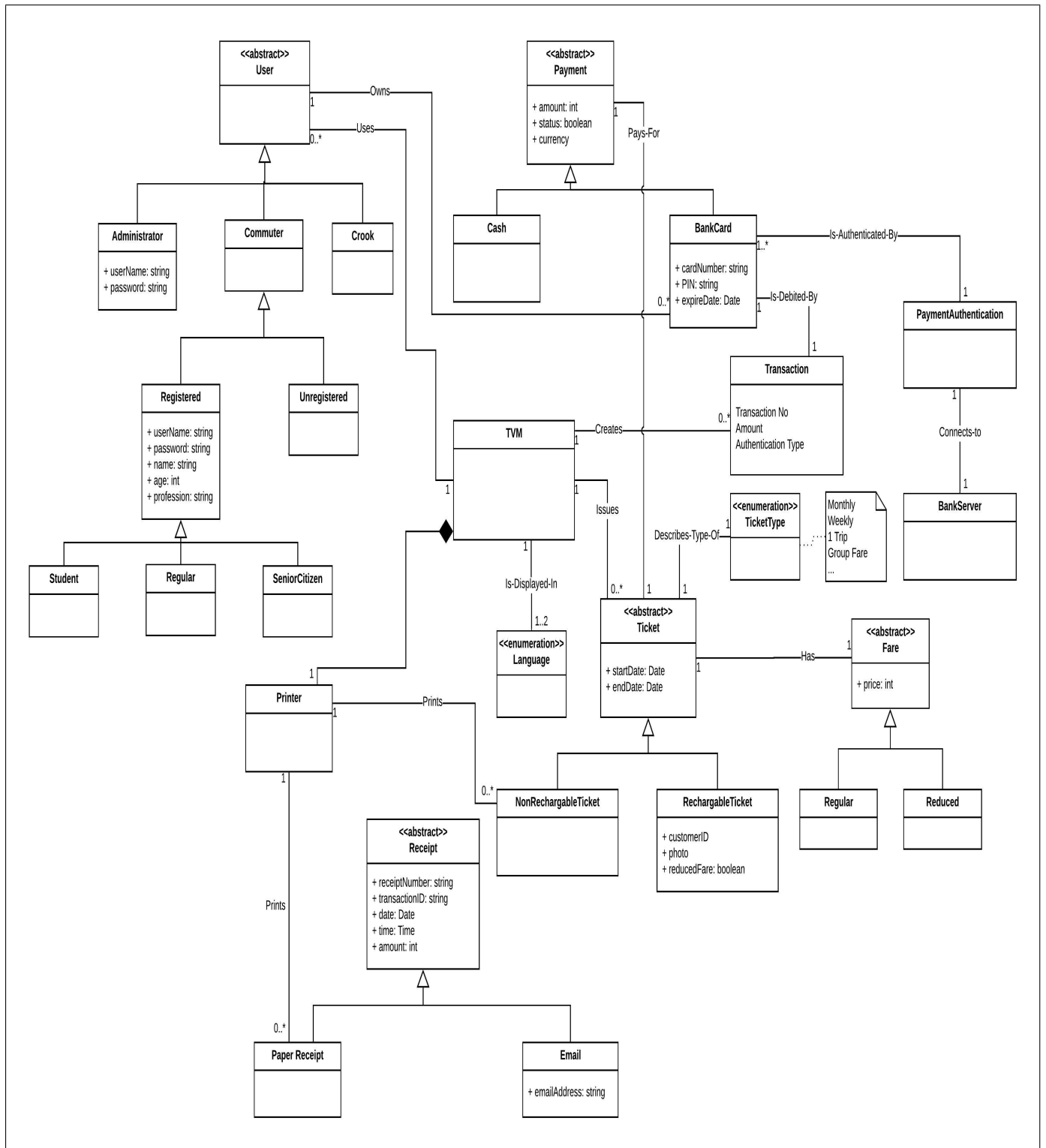
Figure 1.2:   Domain Model

1.4 Problem 4 - Use Case Model[5]

1.4.1 Use Case: Change Language

| Number	1	
Name	Change Language	
Summary	User wants to change to desired language	
Priority	4	
Preconditions	N/A	
Postconditions	User is able to change to desired language	
Primary Actor(s)	TVM Customer	
Secondary Actors(s)	TVM and Administrator	
Trigger	User has chosen to change language	
Main Success Scenarios	Step	Action
	1	User can select the desired language
	2	The application is displayed in desired language
Extensions	N/A	
Open Issues	1	Language available to be decided by the customer
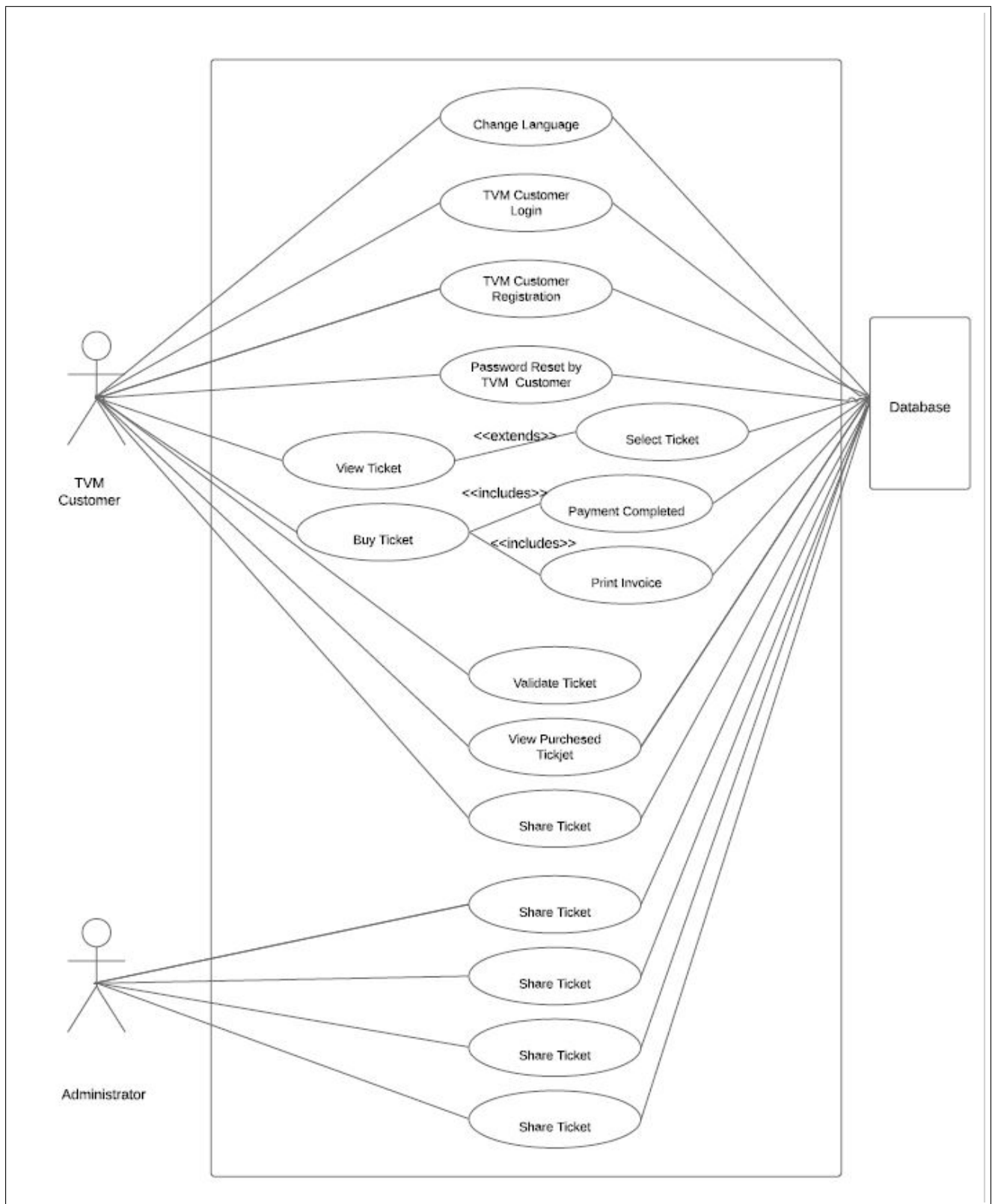
Figure 1.3: Use Case: Change Language

1.4.2 Use Case: View Ticket Plans

Commuters use Ticket vending machine to view ticket plans. Commuter is the primary actor that initiate the use case by choosing to view ticket plans.Secondary actor includes Data Store that supports and responds to the requests. The result for a normal use case scenario is that the customer has viewed different ticket plans. Figure 1.4 explain this use case.

| Number	2	
Name	View Ticket Plans	
Summary	User has viewed different ticket plans	
Priority	1	
Preconditions	N/A	
Postconditions	User has viewed different ticket plans	
Primary Actor(s)	TVM Customer	
Secondary Actors(s)	Data Store	
Trigger	User has chosen to view ticket plans	
Main Success Scenarios	Step	Action
	1	User selects the language
	2	System asks the ticket type
	3	User selects the ticket type
	2	System displays ticket plans
Extensions	N/A	
Open Issues		NA
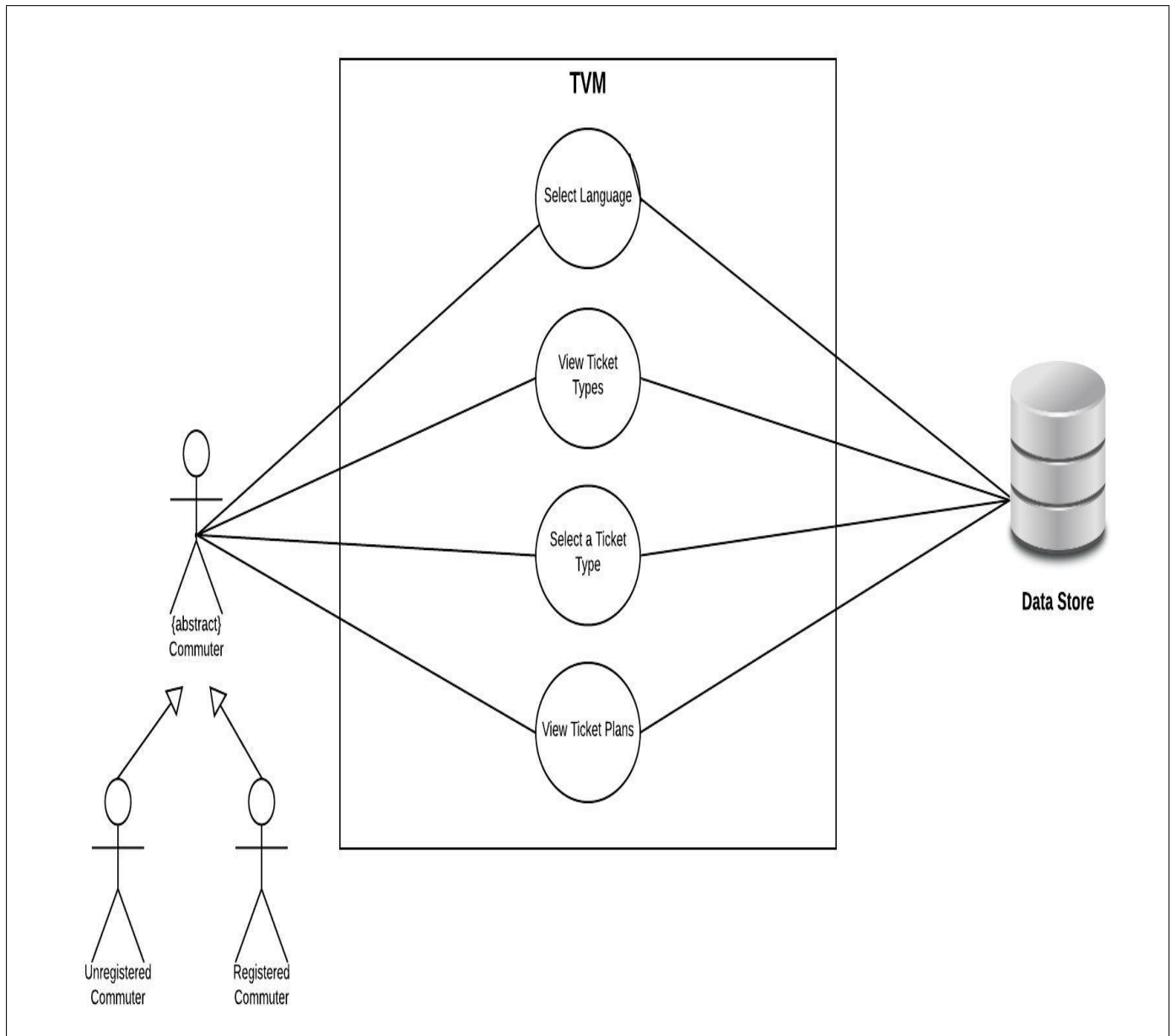
Figure 1.4: Use Case: View Ticket Plans

1.4.3 Use Case: Buy Tickets

Commuters use Ticket vending machine to buy tickets. Commuter is the primary actor that initiate the use case by choosing to buy a ticket. Secondary actors include Payment Authentication and Data Store that support and respond to the requests. The result for a normal use case scenario is that the customer has received the ticket and the receipt. Figure 1.5 and 1.6 and 1.7 explain this use case.

Number	3	
Name	Buy Ticket	
Summary	Customer buy a ticket using TVM	
Priority	1	
Preconditions	Customer has access to a valid payment method	
Postconditions	Customer has received the ticket and the receipt	
Primary Actor(s)	TVM Customer	
Secondary Actors(s)	Payment Authentication, Bank Server, Data Store	
Trigger	Customer has chosen to buy a ticket	
Main Success Scenarios	**Step**	**Action**
	1	Customer selects the language
	2	System displays ticket plans
	3	Customer chooses a ticket plan
	4	System asks for payment method
	5	Customer selects a payment method
	6	Customer makes a payment
	7	System asks for type of receipt
	8	Customer selects the type of receipt
	9	System prints receipt and ticket
	10	Customer removes receipt and ticket
	11	System displays welcome message
Extensions	**Step**	**Branching Action**
	6a	The payment is not successful
	6b	System displays message that payment is not successful
	6c	System exits and displays welcome message
Open Issues		NA

Figure 1.5: Use Case: Buy Ticket
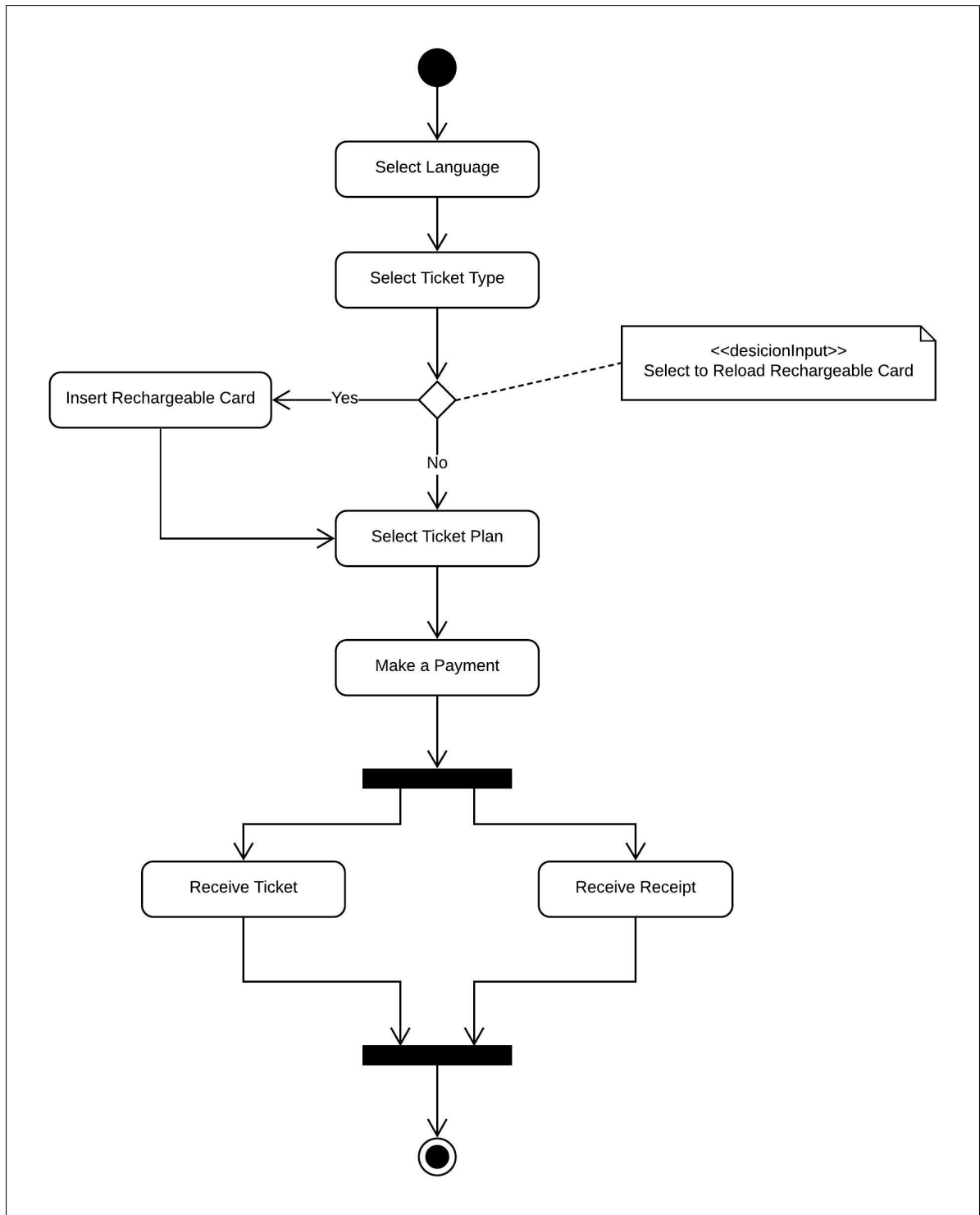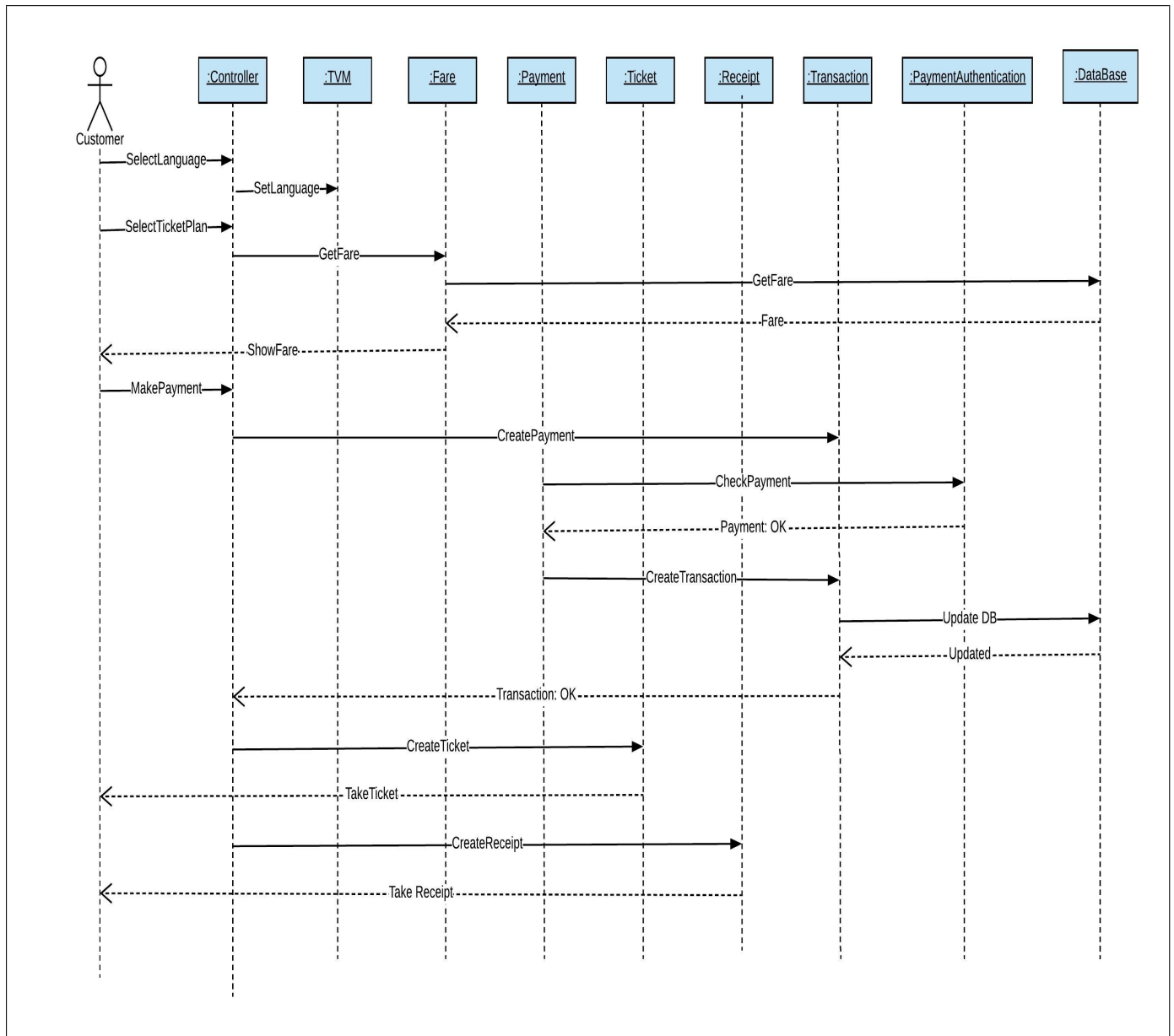
Figure 1.6: Activity Diagram: Buy Ticket

Figure 1.7: Sequence Diagram: Buy Ticket

1.4.4 Use Case: Make a payment

Commuters use Ticket vending machine to make payments. Commuter is the primary actor that initiate the use case by choosing ticket plan.Secondary actor includes Data Store that supports and responds to the requests. The result for a normal use case scenario is that the customer has paid for the ticket plan and got the confirmation of payment successfull or not. Figure 1.8 explain this use case.

Number	4	
Name	Make a Credit Card Payment, Make a cash Payment	
Summary	Customer make payment by card or cash using TVM	
Priority	1	
Preconditions	User has a valid credit card, valid currency	
Postconditions	Transaction successful, user should get the ticket.	
Primary Actor(s)	TVM Customer / Bank Card Reader / Cash Receiver.	
Secondary Actors(s)	Payment Gateway.	
Trigger	User has chosen to buy a metro ticket	
Main Success Scenarios	**Step**	**Action**
	1	System displays ticket types
	2	User chooses the type of ticket
	3	System asks for payment method
	4	User select pay by cash or card
	5	System asks user to insert his card or cash (to cash receiver).
	6	User insert his cash or card.
	7	System asks user to enter the PIN (in case of card payment)
	8	User enter the PIN
	9	System connects to the payment gateway and authentication the user details.
	10	System create a transaction and records the transaction.
	11	System asks how user wants to receive the receipt
	12	User select paper receipt

	13	System prints and dispenses receipt and ticket
	14	User takes out receipt and ticket.
	15	System displays a message to remove the credit card
	16	User removes card
	17	System displays welcome message.
Extensions	**Step**	**Branching Action**
	6a	User insert card into card reader.
	6b	User insert cash into the cash receiver.
	7a	No pin asked in case of cash payment.
	9a	System authenticated the cash denominations in case of cash payment.
	11a	If payment is not successful user will not receive the print receipt message.
	15a	No message displayed in case of cash payment.
Open Issues		NA

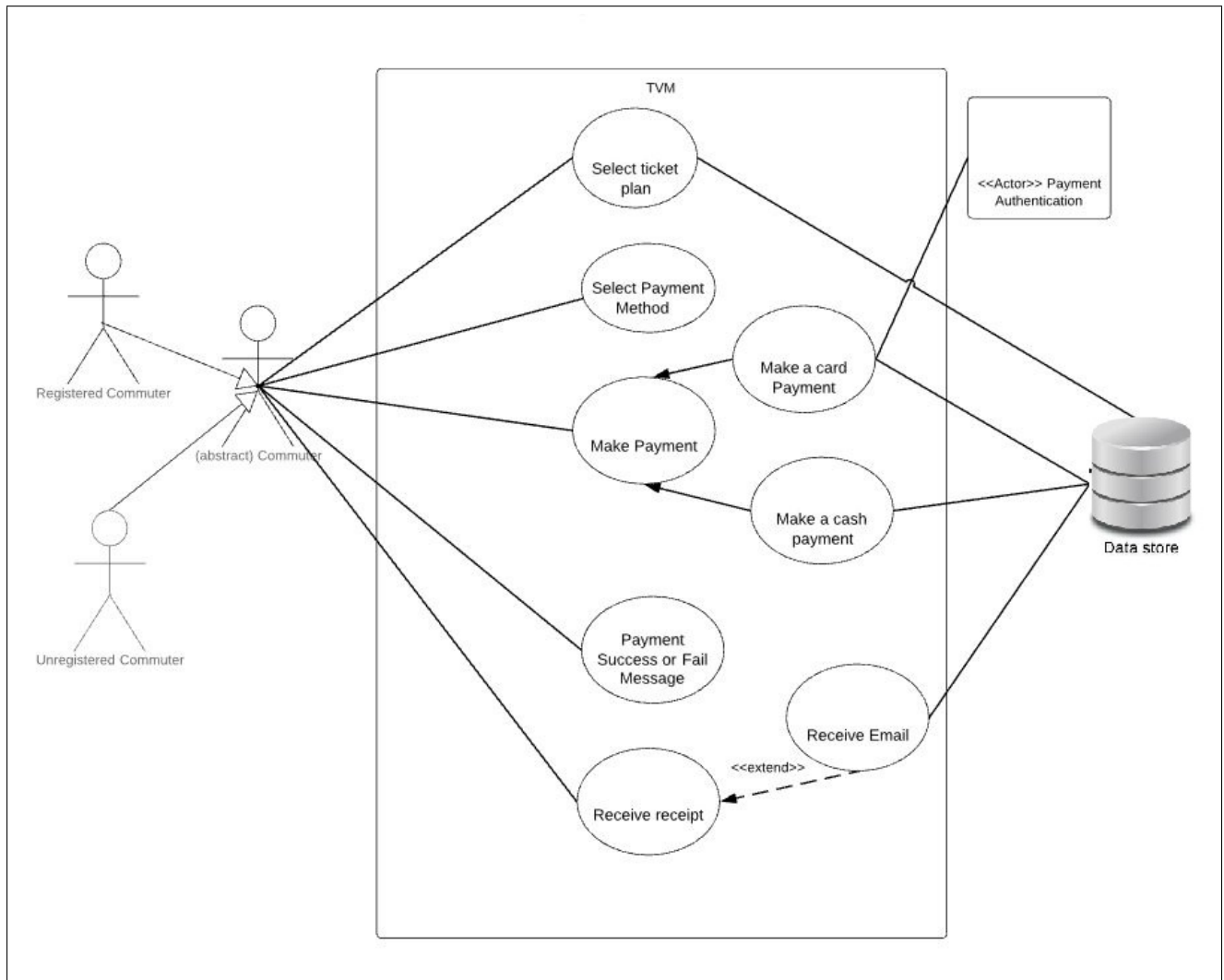Figure 1.8: Use Case: Make Payment

1.4.5   Use Case: Reload Rechargable Card

Commuters use Ticket vending machine to recharge their rechargeable card. Commuter is the primary actor that initiate the use case by inserting his/her card. Secondary actors include Payment Authentication and Data Store that support and respond to the requests. The result for a normal use case scenario is that the customer has recharged his /her card and received the receipt. Figure 1.9 and 1.10 explain this use case.

Number	5
Name	Reload Rechargeable Card
Summary	Customer reloads the rechargeable card using TVM
Priority	1
Preconditions	User has a Rechargeable card
Postconditions	User has recharged the card and received a receipt
Primary Actor(s)	TVM Customer
Secondary Actors(s)	Data Store
Trigger	User has chosen to reload the card

| **Main Success Scenarios**	**Step**	**Action**
	1	User inserts the rechargeable card in the machine
	2	User selects the language
	3	User select the option to recharge the card
	4	System displays different recharge plans
	5	User chooses the recharge plan
	6	System asks for the payment method
	7	User choses the way of payment
	8	User done with the payment
	9	System displays the message to retrieve the rechargeable card
	10	User removes the card.
	11	System asks the user if he wants to print receipt
	12	User select the option from Yes or No
	13	System prints and dispenses receipt
	14	System displays welcome message
Extensions	**Step**	**Branching Action**
Open Issues	22	NA
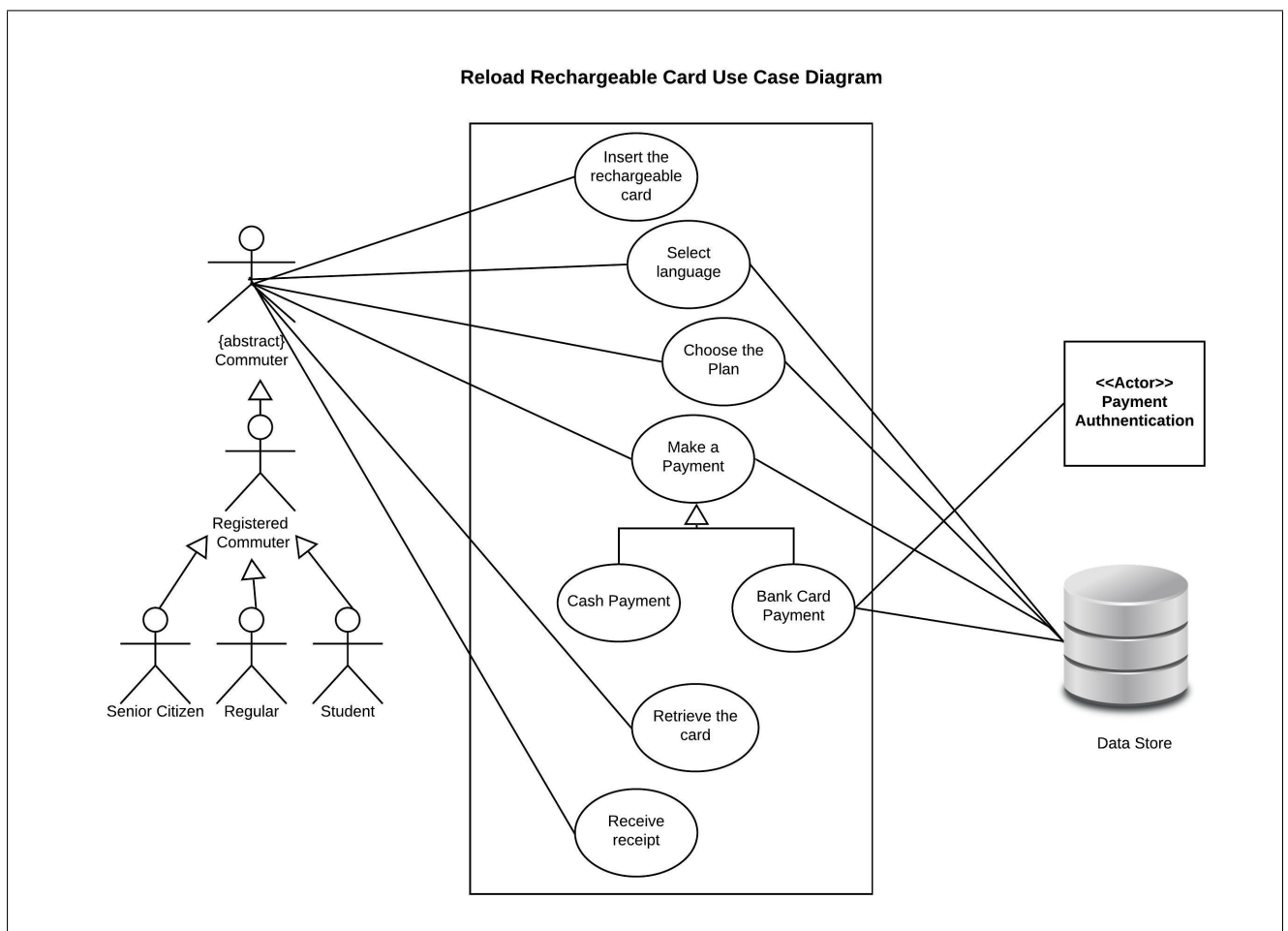
Figure 1.9: Use Case: Reload Rechargeable Card
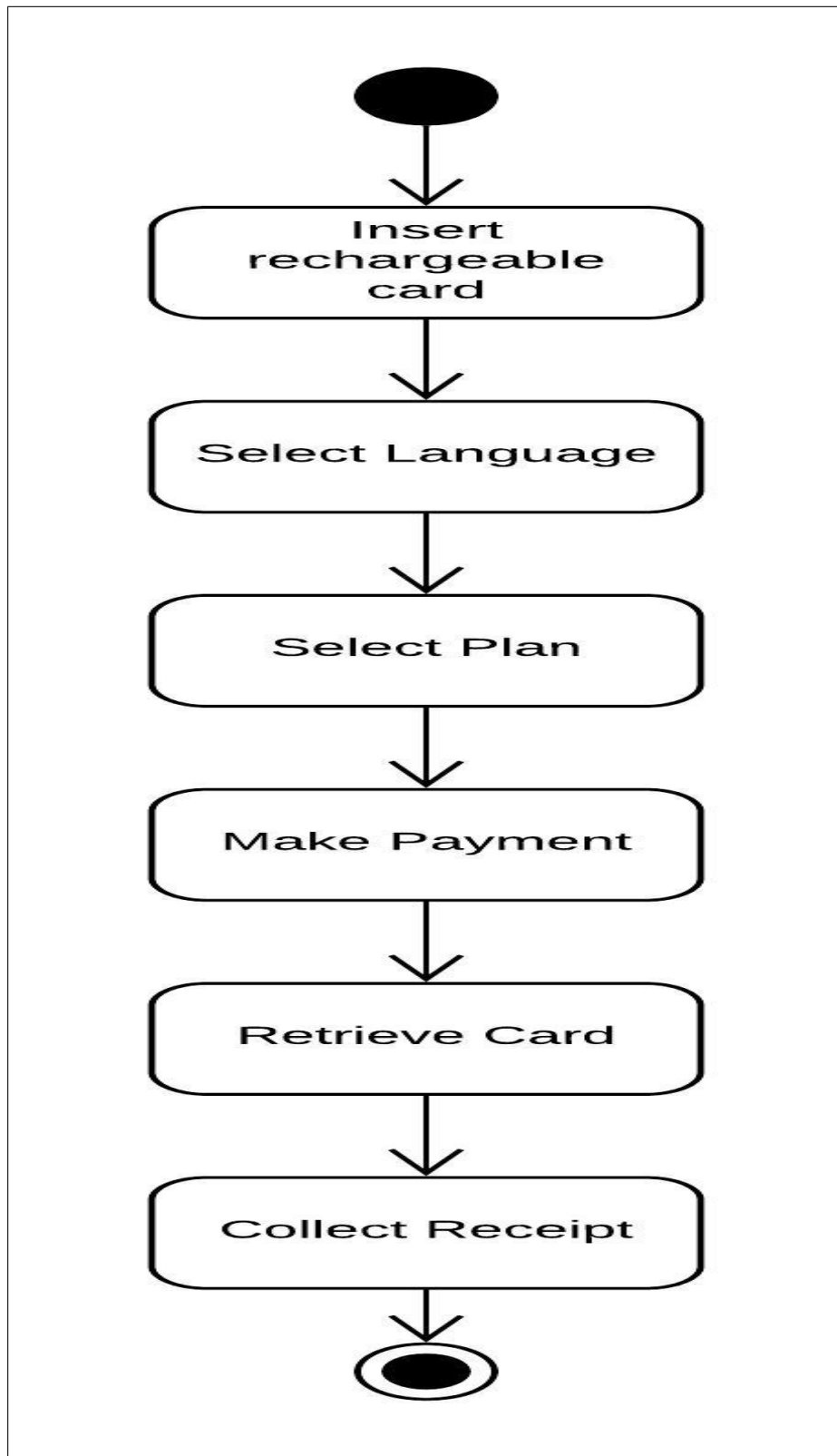
Figure 1.10: Activity Diagram: Reload Rechargeable Card

1.4.6 Use Case: Manage Ticket Specification

Administrator can manage the tickets exiting in the system. He is the primary actor responsible for the Ticket Vending Machine Management. Administrator of the Ticket Vending Machine has the access to create new tickets, modify the existing tickets, view the existing tickets and delete the existing tickets.

| Number	6	
Name	Manage Ticket Specification	
Summary	Administrator to update an existing ticket specifications	
Priority	2	
Preconditions	Administrator should have a valid account	
	Administrator should be logged into the application	
Postconditions	Administrator is able to edit an exiting ticket plan.	
Primary Actor(s)	TVM Administrator	
Secondary Actors(s)	TVM and Customer	
Trigger	The Administrator has selected to update	
	ticket specifications on the system.	
Main Success Scenarios	**Step**	**Action**
	1	Admin selects the tickets to be modified.
	2	Admin change the ticket specification.
	3	Admin saves the new ticket specifications.
	4	Admin updates the system with updated ticket plans.
Extensions	**Step**	**Branching Action**
	3a	Admin does not have the admin access to the system.
	4a	The system gives an error.
Open Issues		NA
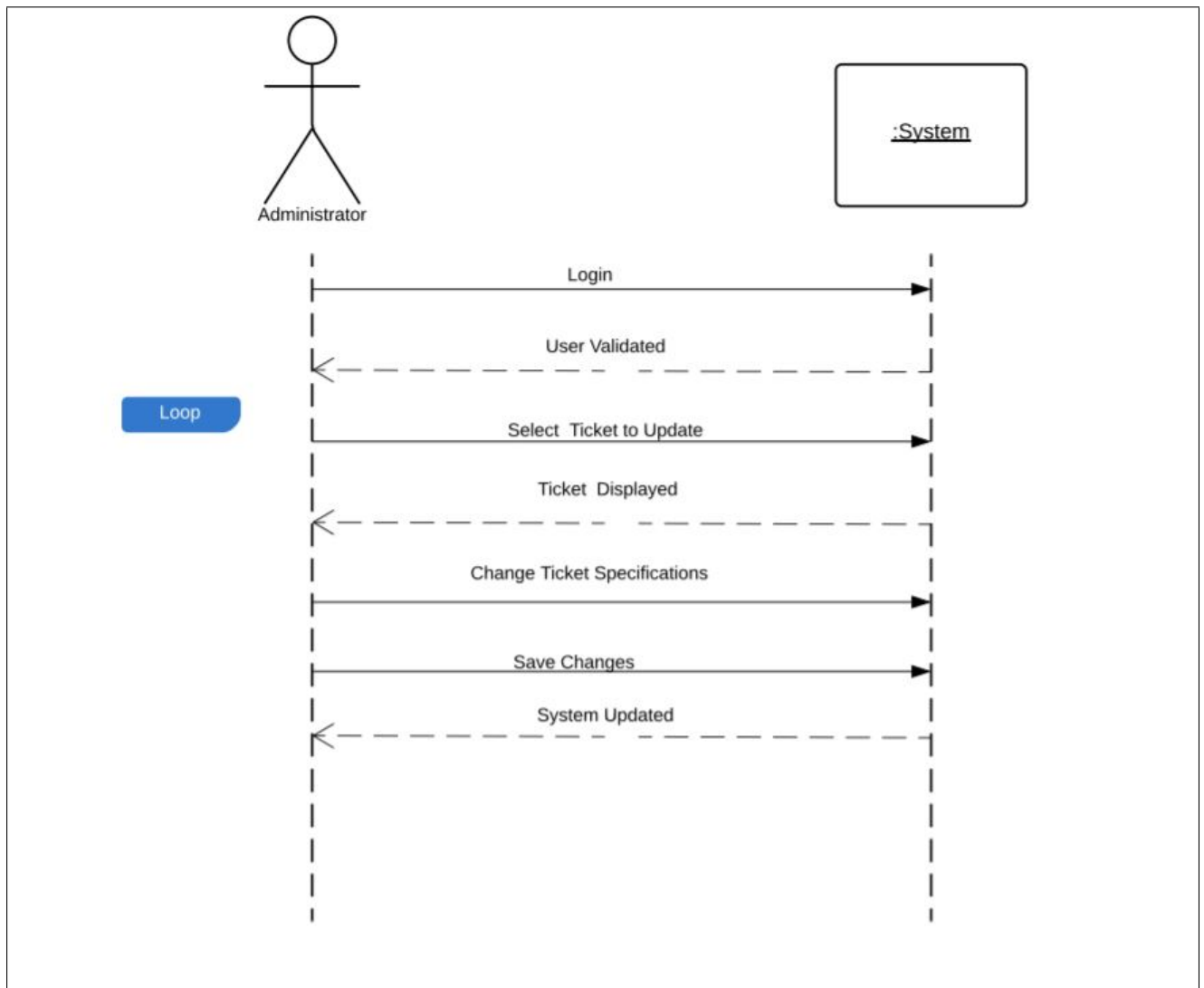
Figure 1.11:   Sequence Diagram: Admin Sytem

1.4.7 Use Case: Customer Registration

Commuter(New User) use Ticket Vending Machine to register himself/herself with the STM. Commuter is the primary actor that initiate the use case by choosing the register option. Secondary actor includes Data Store that supports and responds to the requests. The result for a normal use case scenario is that the customer got registered with the STM. Figure 1.12 and 1.13 explain this use case.

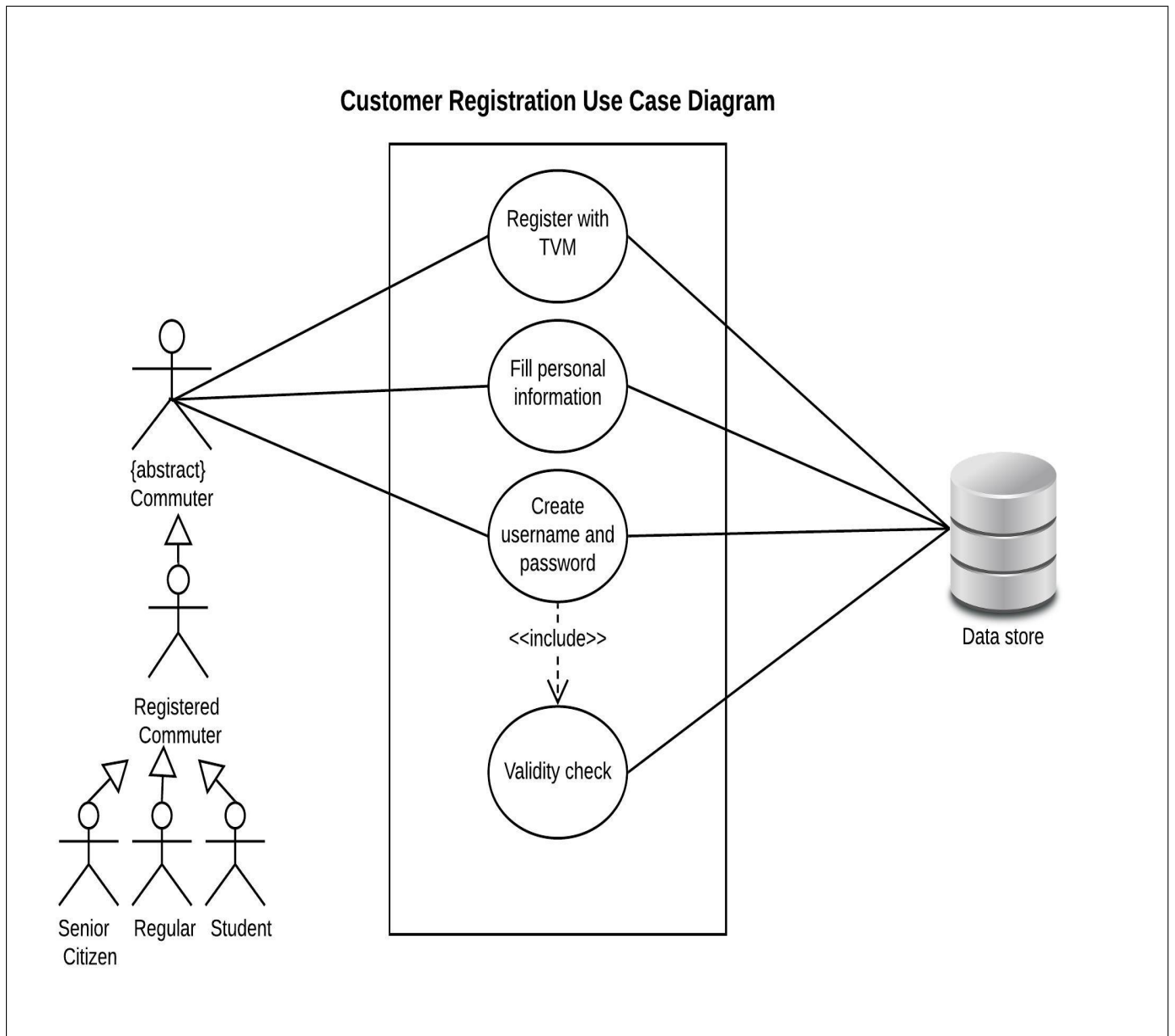| Number	7	
Name	Customer Registration	
Summary	Customer register with his personal information to get the card	
Priority	2	
Preconditions	N/A	
Postconditions	User is registered	
Primary Actor(s)	TVM Customer	
Secondary Actors(s)	Data Store	
Trigger	User has chosen to register himself for the STM	
Main Success Scenarios	**Step**	**Action**
	1	User selects the register option
	2	System asks for his personal identification information
	3	User fills all the information and submit it
	4	System asks for the username and password
	5	User creates a username and password
	6	System checks for the validity of the user
	7	System registers the user and shows a registered user message
Extensions	**Step**	**Branching Action**
Open Issues		NA

Figure 1.12: Use Case: Customer Registration
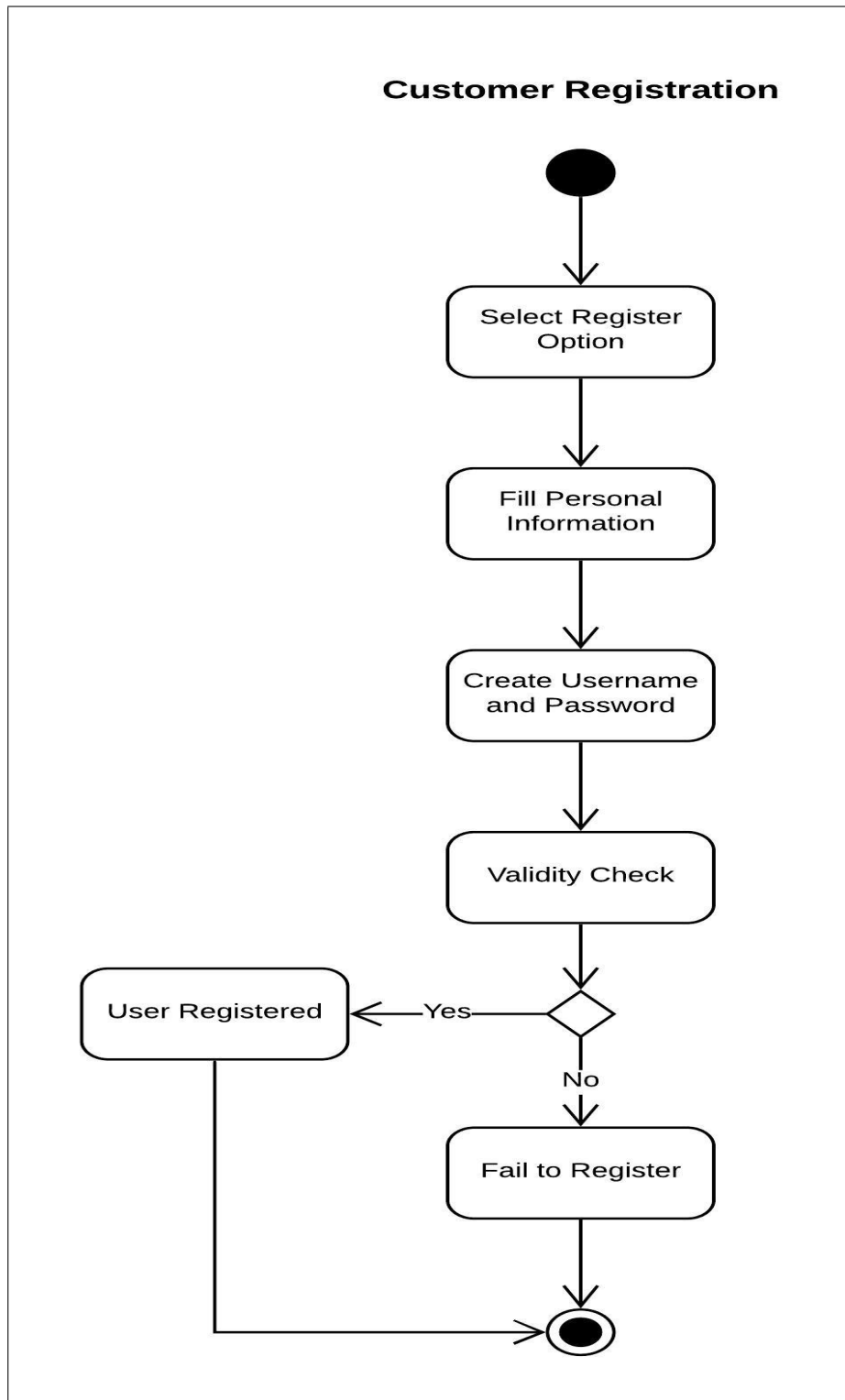
Figure 1.13: Activity Diagram: Customer Registration

1.4.8   Use Case: False Login[3]

Number	7
Name	False Login
Summary	Hacker try to login into someone else account.
Priority	1
Preconditions	N/A
Postconditions	Login should fail with appropriate error message.
Primary Actor(s)	Hacker / TVM.
Secondary Actors(s)	Data Store
Trigger	User account locked after 5 unsuccessful login attempts.

Main Success Scenarios	Step	Action
	1	Hacker try to login into system.
	2	Hacker enters username and password.
	3	System will validate user details from database system.
	4	System decline unauthorized access. System should display appropriate error message.
	5	System should display appropriate error message.
	6	Hacker keeps on entering invalid credentials to try to login into someone account.
	7	System will lock user account after 5 unsuccessful login attempts.
	8	System should display account locked error message to user.
Extensions	**Step**	**Branching Action**
Open Issues		NA

1.4.9   Use Case: Password Reset

Use Case Diagram

The password reset use case diagram explains how a customer will be able to reset the password of his/her account. The password reset will include another use case called authenticate. This can be either by security questions or by email.
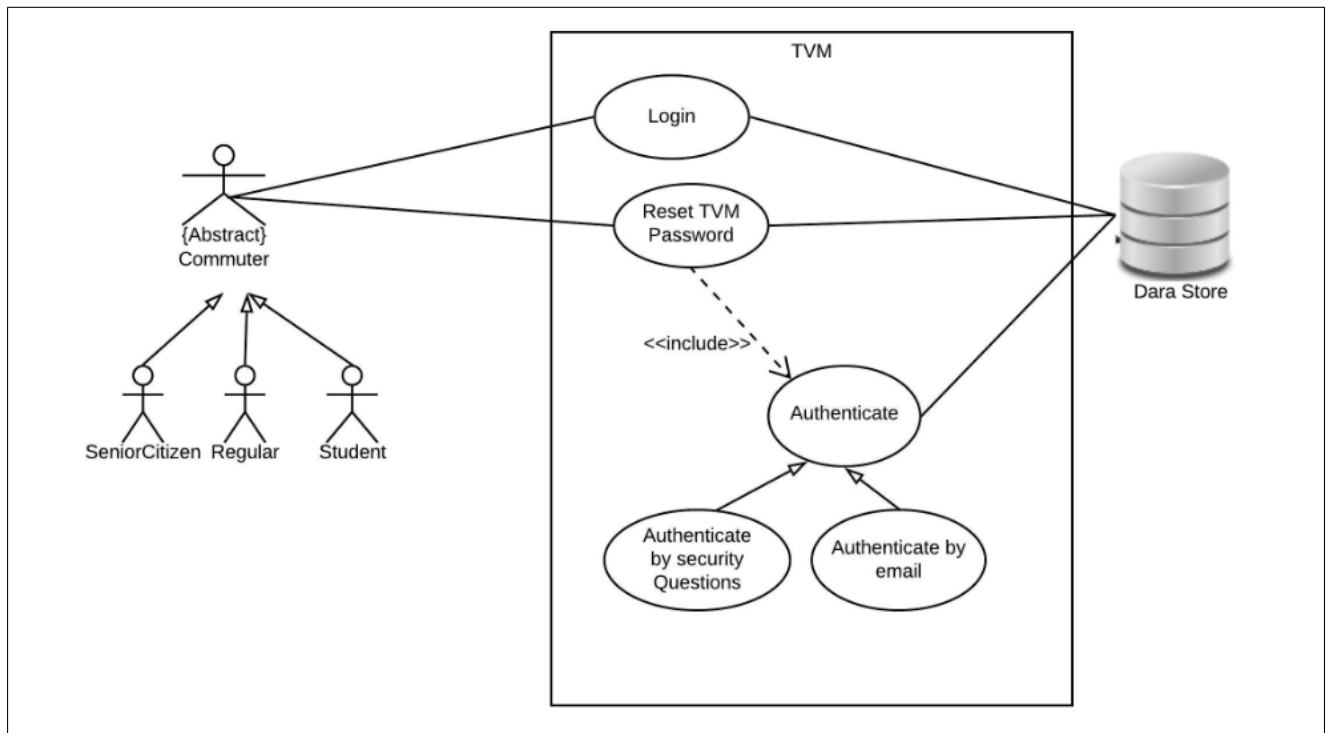

Figure 1.14:   Use Case Diagram: Password Reset

Activity Diagram

The activity diagram is for the Password reset. The sequential steps are as shown, and if the password change authentication fails, the process will be terminated.
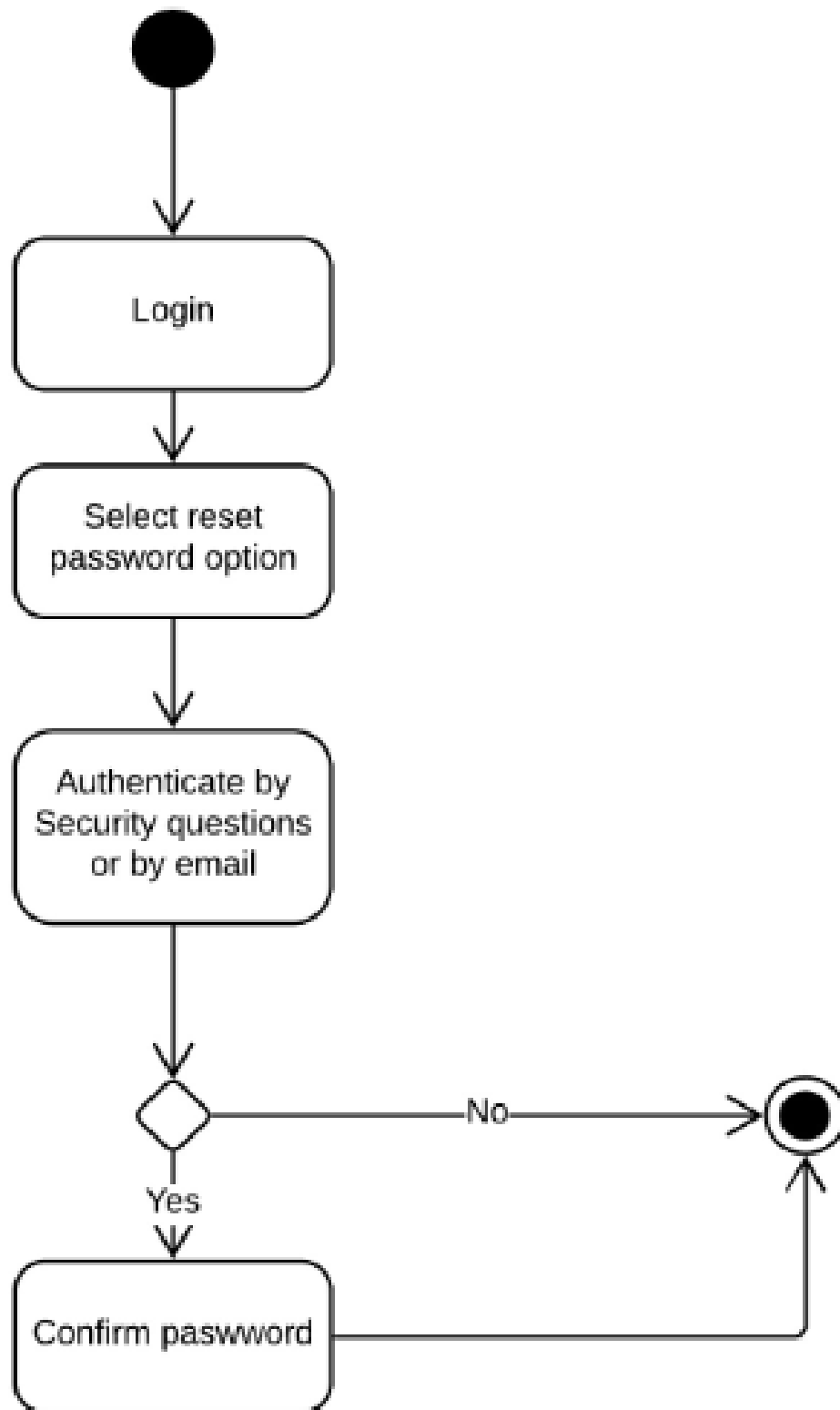
Figure 1.15:   Activity Diagram: Password Reset

1.4.10 Use Case: Payment Fraud

The Payment Fraud use case diagram shows how the payment authentication use case can be threatened by the negative use case called Flood system and Steal card information. The name of the use cases explains the activity of negative use cases.
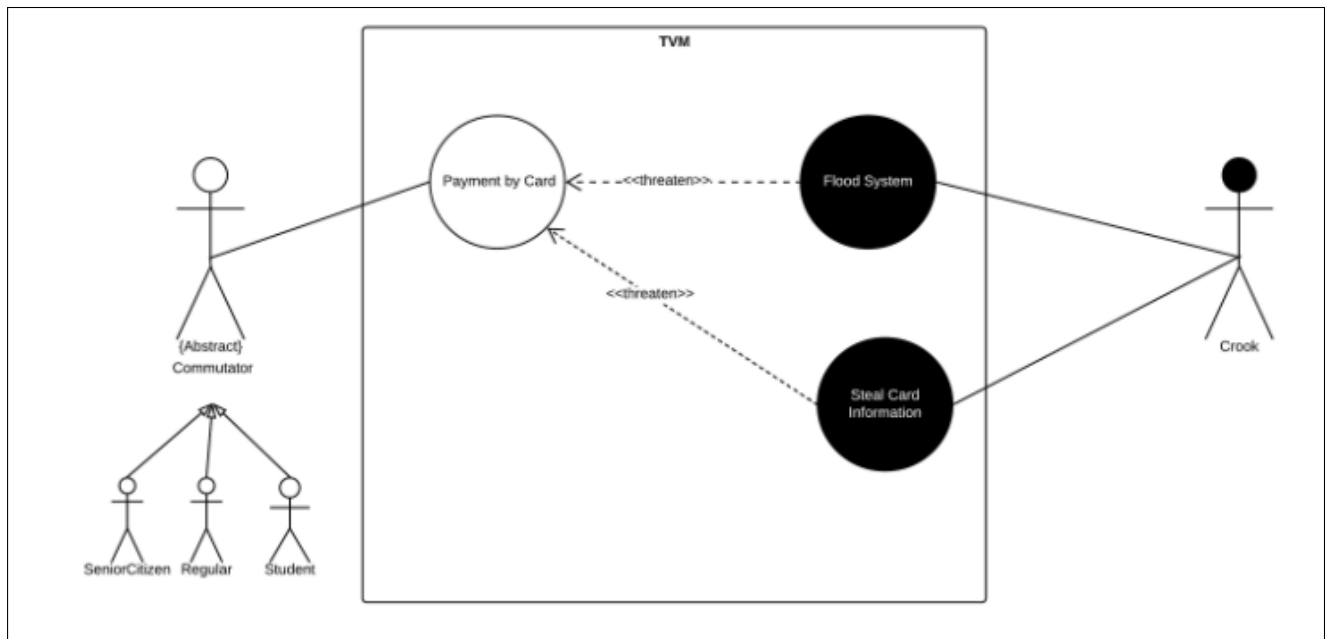

Figure 1.16: Use Case Diagram: Payment Fraud

References

[1] Pankaj Kamthan. *BrainStorming and Mind Map*. 2019.

[2] Pankaj Kamthan. *Introduction to Domain Modeling*. 2019.

[3] Pankaj Kamthan. *Negative Use Case Modeling*. 2019.

[4] Pankaj Kamthan. *Understanding Context*. 2019.

[5] Pankaj Kamthan. *Use Case Modeling*. 2019.

Glossary

iGo The online Ticket Vending Machine Web Application integrating with STM system. 2

Non-Rechargable Card One time use and throw card.. 2

OPUS The online Ticket Vending Machine Web Application integrating with STM system. 2

Rechargable Card A card that can be recharged to be used monthly, weekly.. 2

Reduced Fare Fare offered at reduced rates that the normal prices for certain users that qualify for it.. 3

Regular Fare Normal Fare Prices.. 8

Transaction A digital record is generated when user interacts with the system.. 2

TVM The online Ticket Vending Machine Web Application integrating with STM system. 2

Acronyms

STM Société de transport de Montréal. 2