



SOEN 6481

SOFTWARE SYSTEMS REQUIREMENTS SPECIFICATION: SECTION SS

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Deliverable 1

Group B

Team Members

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PROBLEM 1:

Description

iGo is an electronic payment system that makes travelling on transit faster and easier by eliminating the need for tickets, tokens, passes and cash. It works across local transit services in Canada, making paying for your trip simple, convenient and secure. It also allows customers to travel seamlessly across multiple transit agencies with the one electronic fare card by tapping their card at stations and on buses.

It is actively investigating ways to enhance the customer experience such as self-service devices and mobile device applications. The system was designed to accommodate developments in fare payment technology. While iGo currently operates on a closed loop, its system is based on an open architecture, which supports multiple vendors and emerging technologies including contactless debit/credit, near-field communication (NFC) and enhanced online services.

With iGO, it is assumed that metro stations and buses have smart phones/tablets on which the application will be installed, to scan and validate the electronic tickets. With the official iGo app you can manage your card anytime, anywhere. Loading your iGo card has never been easier. You can:

- load funds and transit passes (instant load available on Android devices with NFC)
- receive low balance/pass expiry reminders and email receipts for fare purchases
- pay with Apple Pay and saved payment method
- set up and manage Auto load and Auto renew
- manage multiple iGo cards
- check your iGo card balances
- view your transaction history
- buy an iGo card and create an iGo account

You can download the iGo App now from the Google Play Store or the Apple App Store. The current month's passes are available up to the 8th day of the month. Next month's passes are available as early as 12 days before the end of the month.

You can purchase an iGo Monthly Pass: 1)through the iGo app ,2)at one of our Fare Vending Machines or Self-Serve Reload Machines, located at all iGO metro stations

iGO fares

\$3.10 (Adult)
\$2.15 (Senior, age 65+ / Youth, ages 13-19)
Save up to \$1.60 per trip when you transfer between Transits.
Monthly pass (Adult - \$151.15; Senior/Youth - \$122.45)
12 Month Pass (Adult - \$138.55; Senior/Youth \$112.25)
Post-Secondary Monthly Pass (\$122.45)
iGo Tickets (One-ride - \$3.25; Two-ride - \$6.50; Day pass - \$13.00)

The Software system must have a Very High Performance, Low-Latency, High Traffic management, Highly Available, Secure, and Accurate.

The payment for the Ticket Purchase is out of scope for this project and will not describe in the specifications. However, a Payment option is added which can be extended for realization. Some additional functionalities of the Software include support for multiple Languages.

PROBLEM 2 :

Using the knowledge of a TVM and its (technical as well as non-technical) environment, Construct a context of use model, say, CUIGO, for a TVM.

NOTE:

There are a number of inevitable constraints. For example, it is conceivable that certain context of use factors of a TVM, such as positive or negative stakeholders, are difficult to elicit for a variety of reasons, including legal constraints. This is because certain stakeholders of a TVM cannot be known publicly for a variety of reasons, including confidentiality. Therefore, CUIGO may have to be 'incomplete' by necessity. The rationale for scoping CUIGO should be highlighted accordingly.

CONTEXT OF USE for Ticket Vending Machine

The context for the ticket vending machine is specific for public transportation. The application would be designed for the mobile, is customized accordingly. The context of use model has been described in the below diagram where the centralized concept is the iGO TVM which is deployed in on the mobiles. The users are using it for generating the tickets for public transportation like busses and trains etc. The software development team on the other hand would be responsible to implement the design and produce the software for people to use on a day to day basis.

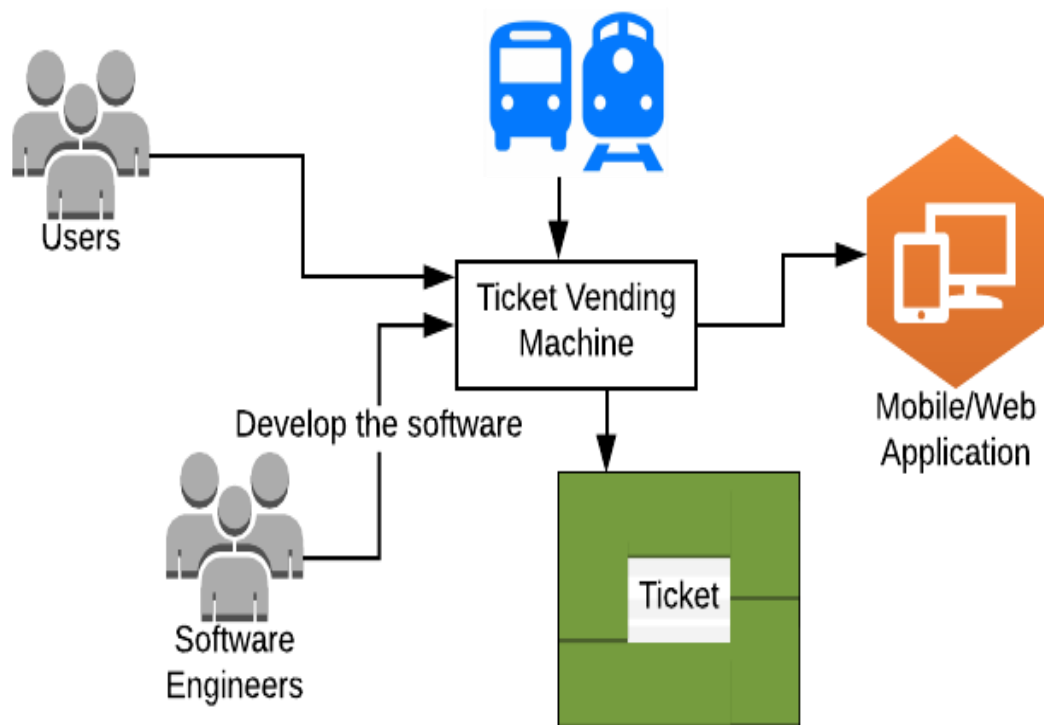


Figure 1. Context of use diagram for Ticket Vending Machine (Source: [Keeling, 2017, Chapter 16].

We use the user-centric context of use framework [1: Kamthan] to identify and classify factors that influence the utility and usability of iGo.

Framework of Context of use Model:[CUIGO]

TYPE OF FACTORS	ATTRIBUTE	DETAILS
User	<i>Age</i>	>6
	<i>Skill</i>	Able to interact and read instruction set
	<i>Education</i>	Basic Details
	<i>Training</i>	Self training needed to operate the vending machine.
	<i>Experience</i>	Previous experience counts with the similar type of TVM
	<i>Mental /Physical Attribute</i>	Mentally presence and physically activeness is needed. TVM should be accessible if the users are blind or physically challenged
	<i>Attention</i>	Full attention needed
User Task	<i>Task specific goals</i>	A complete and successful transaction from user side .for example -1.printing ticket 2. printing receipt
	<i>Criticality of task</i>	Priority high due to the reason that user might be in rush to reach his/her destination.
	<i>Frequency of use</i>	No restriction for user in multiple purchase of ticket in a single day
	<i>Dependency on use</i>	Database connection and power breakage is unacceptable.
	<i>Duration of use</i>	3 minutes of idle state will bring the user back to its home page.
	<i>Risk from error</i>	If at any time user makes a mistake they can always go back or cancel current transaction.
User Role	<i>Admin</i>	1.Network Administrator 2.Security Engineer 3.Software Engineer
	<i>Registered</i>	Users with a valid iGO card.
	<i>New user non-registered</i>	Users or non frequent travellers with no iGO card and are interested in buying tickets according to their needs.
User Goal	<i>Criticality</i>	Highly Critical

	<i>Overall Goal</i>	A complete and successful transaction from user side
<i>User Activity</i>	<i>Sitting</i>	Physically challenged user with for example a wheelchair person should be able to use TVM.
	<i>Standing</i>	User should be able to use TVM in standing position.
	<i>Others</i>	Children >6 or blind user should have proper access to TVM
<i>Location and Time</i>	<i>Location</i>	Available near to every metro station even on the streets
	<i>Time</i>	Ticket will be purchased according to local time zone
<i>Natural Environment</i>	<i>Light</i>	Proper lighting needed even in the brightest day to see the display for all users
	<i>Temperature</i>	TVM will be on the street .So Temperature will play a major role here.
	<i>Sound</i>	Especially for physically challenged users the sound from the system should be in perfect pitch.
<i>Technical Environment</i>	Hardware	
	<i>Screen</i>	Interface with proper button options to select any options.
	<i>Keyboard</i>	Keyboard should be made keeping in mind all kind of users and OK,CANCEL and CLEAR button will be there in GREEN,RED and YELLOW colour.
	Software	
	<i>Server</i>	Server will be running

		24/7. It will accept payment gateways as well. Every transaction will be recorded in the IGO database.
	<i>Operating System</i>	IGO will be using any preferable OS on market.
	Network	
	<i>Connectivity</i>	It will be running 24/7.
	<i>Stability</i>	It should be stable enough to run in a real world with real users.
<i>Social Environment</i>	<i>Ethical Standard</i>	It should follow standard Canadian ethics.
	<i>Legal Constraints</i>	It should follow all the legal rules made by Transport Canada

Mind Map for context of use

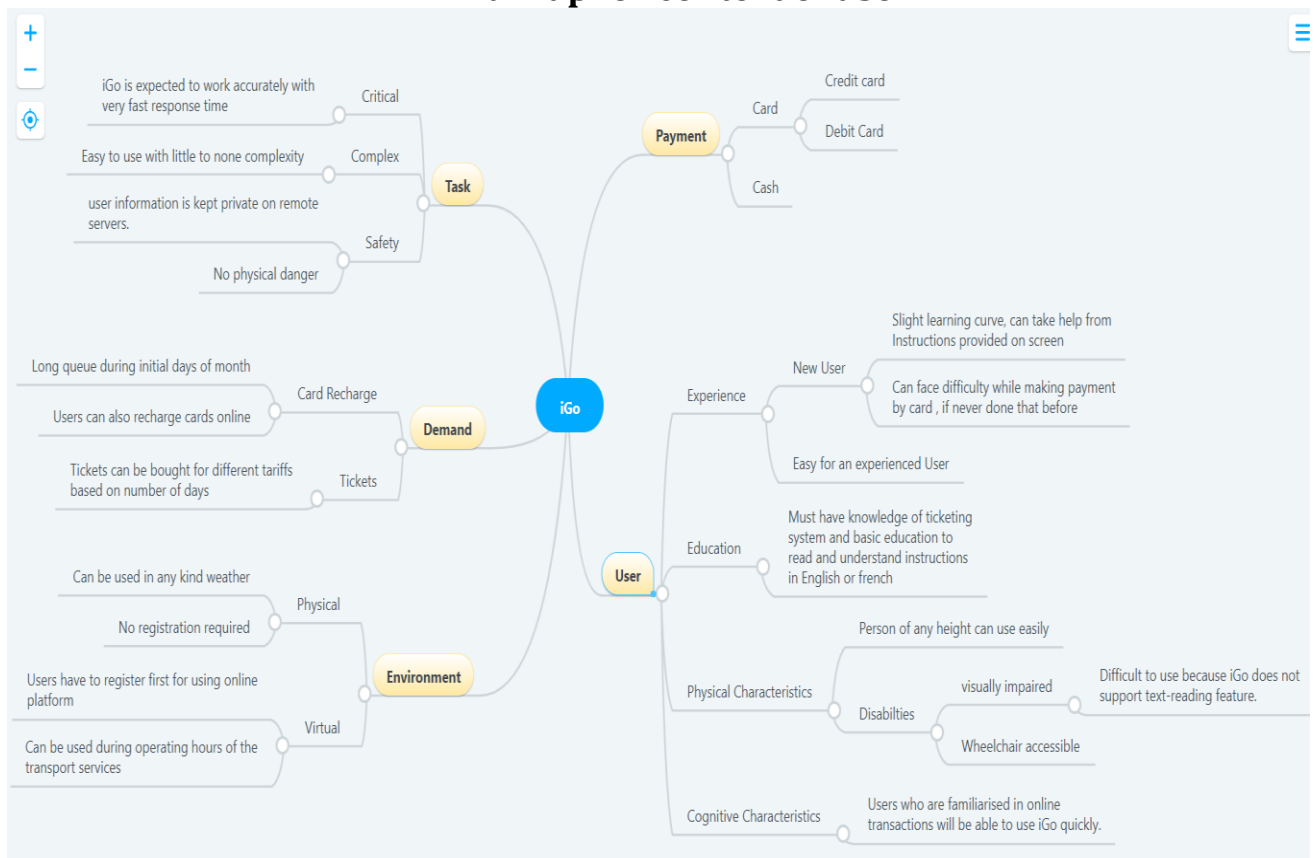


Figure 2. Mind Map - Context of use for Ticket Vending Machine

PROBLEM 3:

To Identify key concepts in a problem domain, it is very important to first identify all the stakeholders, so for that purpose we have used Mind mapping.

A stakeholder is defined as anyone with an interest in the project, irrespective of whether that interest is positive or negative. They may be individuals or organizations that are actively involved in the project, or whose interests may be affected by the execution or completion of the project.

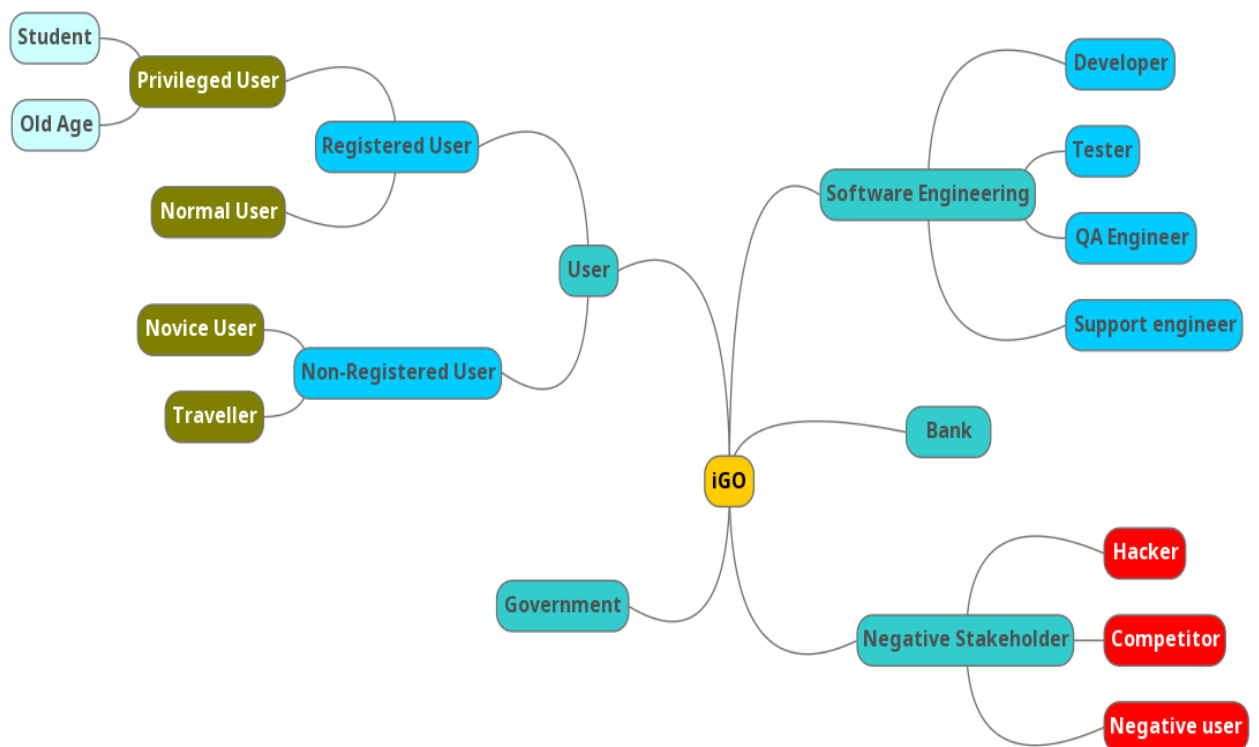


Figure 3. Mind Map : Stakeholders

Vocabulary and key concepts of the problem domain.

→ Transport Authority

Governing and managing authority for iGo TVMs. There is only ONE transport authority for all the TVMs

→ iGo

It is the central concept of domain model and has the responsibility to provide service of buying tickets or recharging metro cards to end users.

Class derived from this concept will have attributes such as:

Location: geographical location of the physical iGo TVM kiosk.

As shown in the domain model diagram iGo has following relationships among other concepts in the domain.

- One Transport Authority manages more than one iGos
- More than one users can use One-to-many iGos.
- Any of the iGo can be used to recharge cards or buy tickets and can be used to generate receipt after that.
- One TVM has only one Payment Gateway

→ **Payment Gateway**

Every iGo has a dedicated payment gateway to process daily payments by users. users can either insert coins or cash or can also use their Debit or credit card for their transactions.

Relationships

- One to one relationship between iGo and payment gateway.
- Every gateway is connected to all major national banks to process transactions.

→ **Bank**

Bank depicts a governing authority related to banking domain, which authenticates and verify payments.

Relationships

- One to one relationships between bank and payment, as one payment can not be authenticated by multiple banks.
- Every payment gateway can be connected to more than one banks.

→ **User**

The end user of the iGo.

Description of relationships

- Every TVM iGo can be used by one to many users.
- Every user has one to many relationships with payment. Because every user can make more than one payment.
- Not every user has Metro card hence many to zero relationships between user and metro card.
- Not every user will buy a ticket if they have metro card, hence many to zero between user and metro ticket

→ **MetroCard**

A RFID based card provided by transport authority to each registered user. Users can recharge their cards at any of the iGo TVM

Description of relationships

- One User can own minimum zero and maximum one card
- Any number of cards can be recharged at any of the iGo TVM

→ **Ticket**

Paper based tickets can be bought from any of the iGO TVM. These tickets validity can differ based on the option selected.

Description of relationships

- Users can buy more than one ticket from any of the TVMs.
- iGo TVM can dispense more than one tickets in a day of its during its life time.

→ **Payment**

Information about transaction is shared with Bank in the form of payment. User can do payment by either Cash or Card (Debit/Credit).

Description of relationships

- Each payment will have one receipt (paper receipt or email receipt).
- One payment will be verified by one bank during a single session created through payment gateway.

→ **Receipt**

Either paper or email receipt or both are provided to customer in return for their payment. This acts as the proof for that particular payment.

Description of relationships

- One receipt has only information about single payment.
- One to many receipts can be generated by a one to many TVMs.

Relationships among all of the entities within the scope of the domain

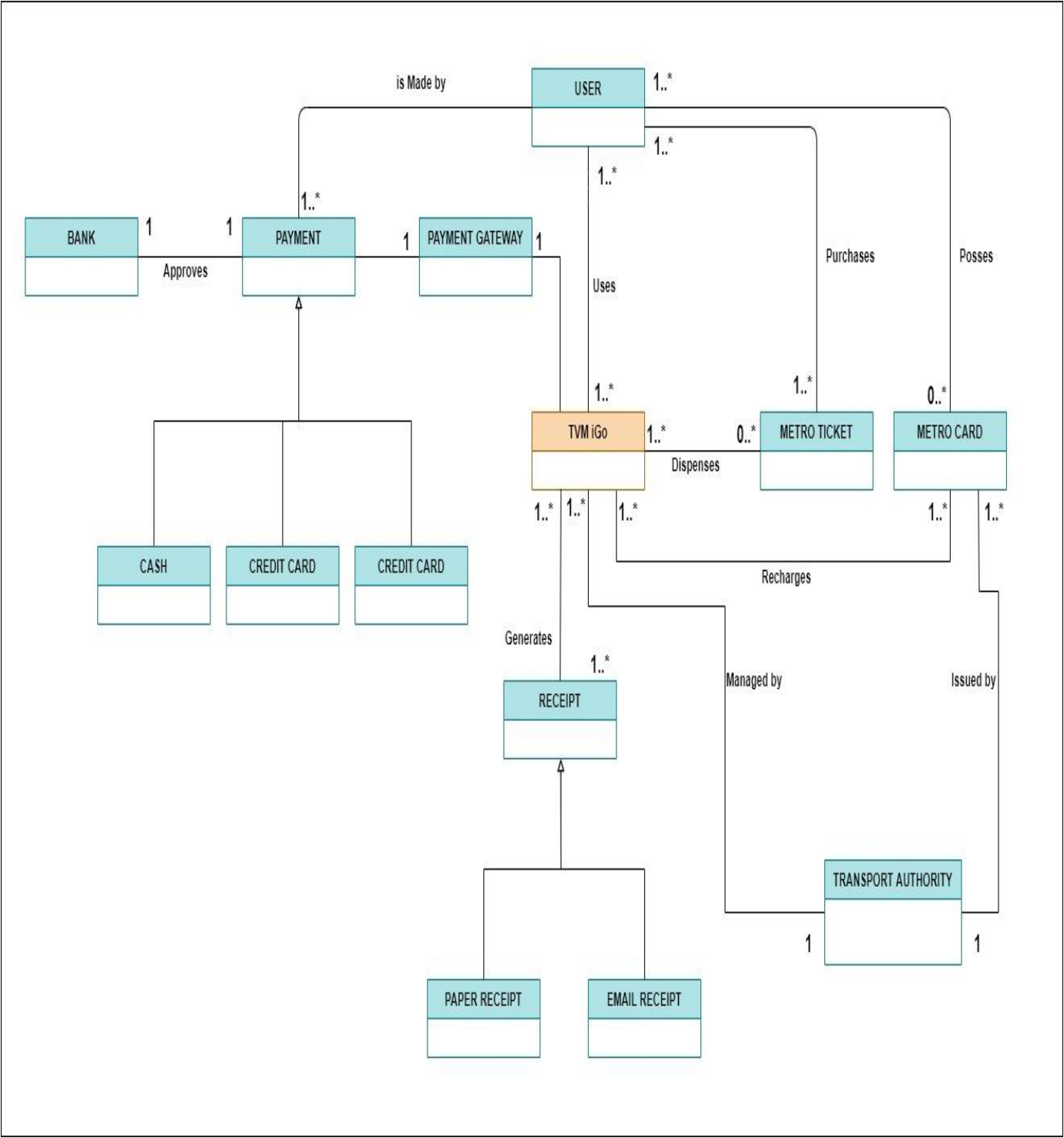


Figure 4. Domain Model : iGO

PROBLEM 4 [40 MARKS]

For your TVM, construct **two different views** of a use case model, say, UCM_{igo}, using UML. For your TVM, elicit, decide, and describe each use case of the TVM. The collection of use cases can include both positive and negative use cases. Furthermore, using UML, express the normal scenario of each positive use case in UCM_{igo}.

NOTE

It is important that behavioral concerns internal to the TVM are ignored.

NAME	Customer Registration
ID	UC1
DESCRIPTION	Customer wants to register with the TVM.
ACTORS	Customer and TVM System
Main Success Scenario	<ol style="list-style-type: none">1. Customer enters required information in the register form2. Customer is asked for Valid ID Proof3. Customer submits the form4. Customer is registered and asked to login
PRE-CONDITIONS	<ul style="list-style-type: none">• Customer has basic knowledge of how to use TVM
POST-CONDITION	<ul style="list-style-type: none">• Customer Account password changed successfully.
EXCEPTIONS/Alternatives	2a. Customer fails to provide valid ID proof.

NAME	Customer Log-in
ID	UC2
DESCRIPTION	Customer wants to log into the application
ACTORS	Customer and TVM System
Main Success Scenario	<ol style="list-style-type: none">1. Customer enters email and password in the login form2. Customer submits the login form3. Customer is able to login to the application
PRE-CONDITIONS	<ul style="list-style-type: none">• Customer is registered with the system.
POST-CONDITION	<ul style="list-style-type: none">• Customer is logged in the application
EXCEPTIONS/Alternatives	<ol style="list-style-type: none">1a. Customer is unable to access the login form2a. Customer is unable to submit the login form3a. Customer is unable to login to the application

NAME	Change Password
ID	UC3
DESCRIPTION	Customer wants to reset account password
ACTORS	Customer and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. Customer answers the security question. 2. Customer enters the new password.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Customer is logged in the system.
POST-CONDITION	<ul style="list-style-type: none"> • Customer Account password changed successfully.
EXCEPTIONS/Alternatives	2a. Customer fails to give correct answer to security question

NAME	Change Language
ID	UC4
DESCRIPTION	Customer wants to change the Language of the system.
ACTORS	Customer and TVM System
Main Success Scenario	1. The customer selects the desired language
PRE-CONDITIONS	N/A
POST-CONDITION	<ul style="list-style-type: none"> • Language of the system is changed.
EXCEPTIONS/Alternatives	1a. Language that user wants to change to is not available.

NAME	View Purchased Ticket
ID	UC5
DESCRIPTION	Customer wants to view already purchased ticket.
ACTORS	Customer and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. Application retrieves the list of Ticket purchased by the customer in the selected Time period. 2. Application displays the retrieved list.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Customer is logged in. • Customer has previously purchased a ticket
POST-CONDITION	<ul style="list-style-type: none"> • Application displays the list of ticket Plans purchased by customer within a time period.
EXCEPTIONS/Alternatives	2a. Customer hasn't bought any ticket yet.

NAME	View Ticket Plans
ID	UC6
DESCRIPTION	Customer wants to view Ticket plans .
ACTORS	Customer and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. TVM System checks for ticket plans. 2. TVM System retrieves the list of Ticket plans 3. Application Displays the list of ticket plans.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Customer is logged in.
POST-CONDITION	<ul style="list-style-type: none"> • Application displays the list of ticket Plans.
EXCEPTIONS/Alternatives	N/A

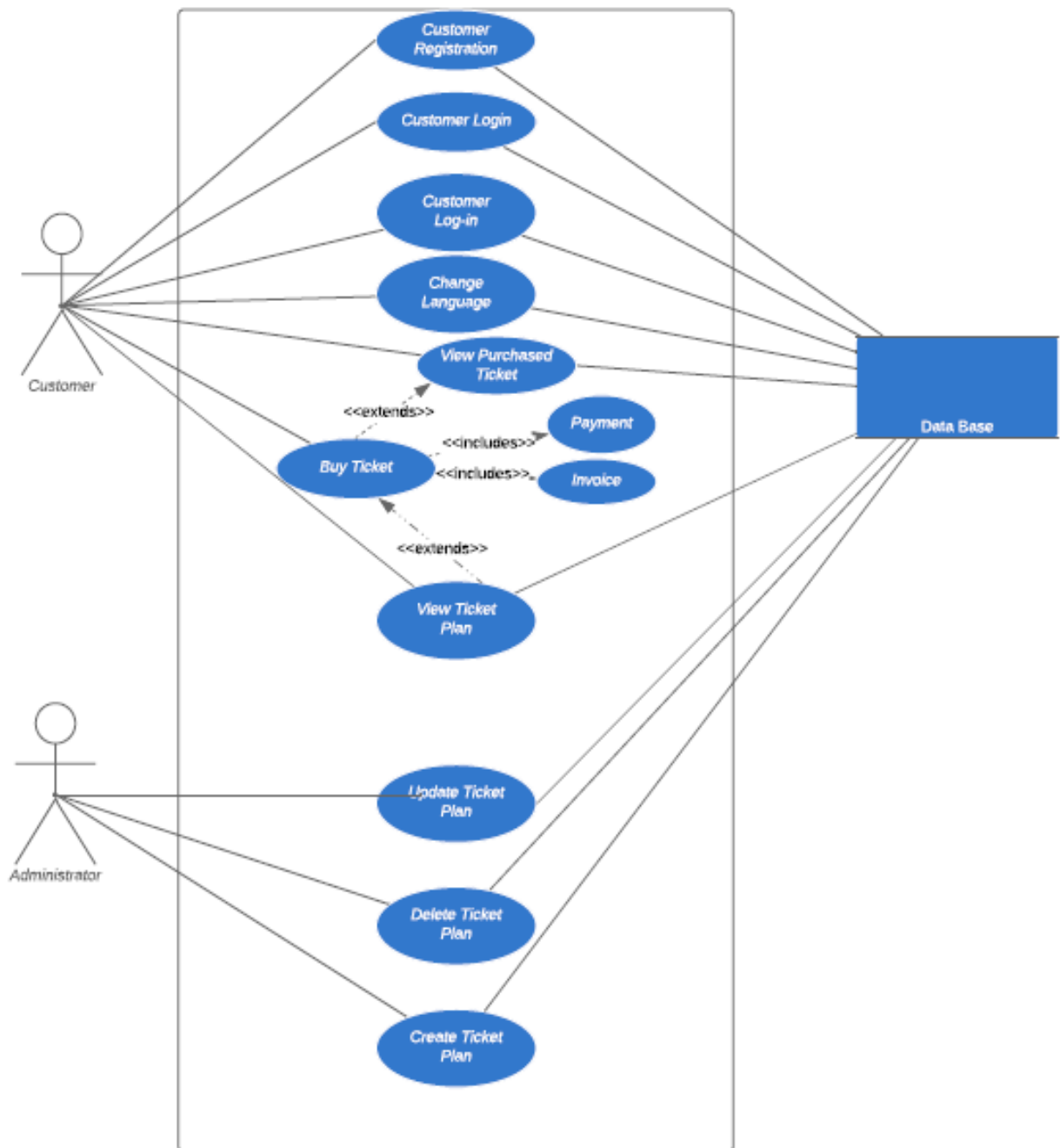
NAME	Purchase Ticket
ID	UC7
DESCRIPTION	Customer wants to purchase Ticket.
ACTORS	Customer and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. Customer selects the desired ticket plan 2. Application redirects User to Payment Options. 3. Customer completes the payment.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Customer is logged in.
POST-CONDITION	<ul style="list-style-type: none"> • Customer is able to purchase the desired ticket.
EXCEPTIONS/Alternatives	3a. Customer is unable to complete the payment.

NAME	Update Ticket Plan
ID	UC8
DESCRIPTION	Administrator wants to modify a Ticket Plan
ACTORS	Administrator and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. Admin selects the ticket plan to be modified. 2. Admin makes changes to the selected plan 3. Admin saves the changes.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Administrator is logged in.
POST-CONDITION	<ul style="list-style-type: none"> • Updated Ticket plan is visible in the Ticket plans screen
EXCEPTIONS/Alternatives	N/A

NAME	Delete a Ticket Plan
ID	UC9
DESCRIPTION	Administrator wants to delete existing Ticket Plan.
ACTORS	Administrator and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. Admin selects the ticket plan to be deleted. 2. Admin deletes selected plan.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Administrator is logged in.
POST-CONDITION	<ul style="list-style-type: none"> • Deleted Ticket Plan is not visible in the Ticket plans screen
EXCEPTIONS/Alternatives	N/A

NAME	Create a new Ticket Plan
ID	UC10
DESCRIPTION	Administrator wants to create a new Ticket Plan.
ACTORS	Administrator and TVM System
Main Success Scenario	<ol style="list-style-type: none"> 1. Admin create new Ticket Plan. 2. Admin specifies the details of the new Ticket Plan(Name, Expiration date and Price). 3. Admin adds the new ticket Plan to the list of Ticket plans available in the System.
PRE-CONDITIONS	<ul style="list-style-type: none"> • Administrator is logged in.
POST-CONDITION	<ul style="list-style-type: none"> • New Ticket plan is visible in the Ticket plans screen
EXCEPTIONS/Alternatives	N/A

USE CASE MODEL [UCMIGO]



Use Case Model Diagram

REFERENCES

- 1.[Keeling, 2017] Design It! From Programmer to Software Architect. By M. Keeling. The Pragmatic Programmers. 2017.
- 2.[Alonso-Ríos, Mosqueira-Rey, Moret-Bonillo, 2018] A Systematic and Generalizable Approach to the Heuristic Evaluation of User Interfaces. By D. Alonso-Ríos, E. Mosqueira-Rey, V. Moret-Bonillo. International Journal of Human-Computer Interaction. Volume 34. Number 12. 2018. Pages 1169-1182.
- 3.<https://www.tutorialspoint.com/articles/how-to-create-a-use-case-diagram>