

Concordia University



SOEN-6481 SOFTWARE SYSTEMS REQUIREMENTS SPECIFICATION(FALL 2019)

TICKET VENDING MACHINE

DELIVERABLE 2 (D2)

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Submitted To:

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GitHub - <https://github.com/m3hrn4z/SRS>
November 27, 2019

Contents

1.1	Problem 5: Personas [2]	3
1.1.1	Student	3
1.1.2	Professional	5
1.1.3	Senior Citizen	6
1.1.4	Occasional traveller	7
1.1.5	Frequent Traveller	8
1.1.6	Visually Impaired	9
1.1.7	Differently Abled	10
1.1.8	Negative User	11
1.1.9	Negative User: Hacker	12
1.2	Problem 5: Global Constraints	13
1.3	Problem 5: User Stories [4]	14
1.3.1	User Story : Customer Login	14
1.3.2	User Story : Select Language	15
1.3.3	User Story : Select Ticket Type	16
1.3.4	User Story : View Ticket Plans for Rechargeable card	17
1.3.5	User Story : View Ticket Plans for Non-Rechargeable card	19
1.3.6	User Story : Select Payment Method	20
1.3.7	User Story : Make Cash Payment	21
1.3.8	User Story : Make Card Payment	22
1.3.9	User Story : Cancel Seleted Plan	24
1.3.10	User Story : Print Receipt	25
1.3.11	User Story : Card Payment Fraud	26
1.3.12	User Story : Hacking TVM admin login	27
1.4	Problem 6: Traceability Matrix [3]	29
1.4.1	Traceability Matrix	29
1.4.2	Traceability Matrix(Extended)	32
1.4.3	Traceability Matrix(Other Resources)	33
1.5	Problem 7: Implementation Document	34
1.5.1	Implementations - User Story: TVM-US-01	34
1.5.2	Implementations - User Story: TVM-US-03	36
1.5.3	Implementations - User Story: TVM-US-05	37
1.5.4	Implementations - User Story: TVM-US-07	39
1.5.5	Implementations - User Story: TVM-US-09	40

Glossary	42
Appendices	42
A Appendix	42
A.1 Interviews	42

Deliverable - 2

1.1 Problem 5: Personas [2]

1.1.1 Student



NAME

Mariam

MARKET SIZE



TYPE

Rational

Demographic

Female 25 years

Montreal

Single

Education: Under-graduation

Occupation: Student

Language: French, English

Goals

She want to get the monthly plan in discounted price for the students

Routine Commute

Go university 5 days a week

Background and Behaviors

Mariam is a Software Engineering student in her second year. She has a good hand over developing mobile applications and always eager to learn about new technologies. She is a punctual student who attends her all lectures.

The preferred mode of travel for her is public transport instead of private to contribute in saving the planet from the air pollution

Skills

Development



Artificial Intelligence



Reading



Motivations

To commute from home to university and back in cheap prices

Needs and Pain Points

High price of the monthly pass


Preferred Payment Method

Prefers to pay by card

Figure 1.1: Persona: Student

1.1.2 Professional


PROJECT: iGo



NAME

Gabriel

MARKET SIZE

 30 %


TYPE

Idealist

Goals


To buy monthly pass for weekdays, as he work from Monday to Friday

Demographic

 Male

30

years

 Montreal

Married

Education: Graduation

Occupation: MBA / Accounting

Language: French, English

Routine Commute

Go to office on weekdays

Background and Behaviors

Gabriel is certified public accountant with an experience of 5+ years. Currently, he is working in a giant firm from 9 am to 4 pm. As he lives far away from the workplace, so he have to leave early in the morning for the work and catch the metro to go there.
On weekends, he go for the parties on his own car as the service of the metro and bus is not available to the city outskirts

Motivations

To make the best use of service offered by government with advantages to working people

Needs and Pain Points


No such plan for people who use the metro service on weekdays only

Preferred Payment Method

Prefers to pay by card


Skills

Oracle




0 25 50 75 100

Critical Thinking



0 25 50 75 100

Communication




0 25 50 75 100


Figure 1.2: Persona: Working Professional

1.1.3 Senior Citizen

PROJECT: CJM for Mobile Radio App



Susan Kubrock , 76

MARKET SIZE
 **5 %**

TYPE

Rational

Goals

Buy a multiple-trip ticket to go to the grocery store

Routine Commute

Go shopping one day a week, often every Saturday.

Background and Behaviors

Susan is a senior citizen. She leaves far away downtown. She usually goes shopping on a weekly basis with her husband.

They don't have a private car and they use the bus to go to grocery stores.

As they don't have any children or family members in Montreal, they don't need to buy a monthly plan ticket. For them, it is more economical to buy a multi-trip plan.

Motivations

Discount on multiple-trip prices


Needs and Pain Points

Needs a system with accessibility and ease of use

Preferred Payment Method


Prefers to pay by cash

Demographic

 Female

76

years

 Montreal

Married


Education: High School

Occupation: Housewife

Language: French


Skills

Reading



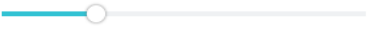
0255075100

Writing



0255075100

Computer Literacy



0255075100

Figure 1.3: Persona: Senior Citizen

6

1.1.4 Occasional traveller

PROJECT: Occasional Traveler

NAME


Sadie Taylor

MARKET SIZE

10 %

TYPE

Idealist



Demographic

Female

35 years

Canada

Married

Homemaker

Skills

Cooking

0255075100

Reading

0255075100

Computer Literacy

0255075100

Goals

She wants to get a daily or one-time pass as she occasionally uses the metro.

Education

Sadie is a 5th Grade dropout and has very little knowledge on how to operate digital devices.

Background

Sadie left school when she was in 5th Grade. She worked as a Kitchen Helper for a few years until she got married. After marriage, she left the job and now takes care of the home. She uses metro and bus occasionally.

Needs and Pain Points

She need a simple ticketing machine to get her daily or one time pass. As she is not comfortable with digital devices, she wants the machine to be very easy to use.

Motivations

She wants to use the metro when she go our for shopping or to visit family and friends.

Preferred Payment Method

Prefers to pay by cash

Figure 1.4: Persona: Occasional Traveller

7

1.1.5 Frequent Traveller

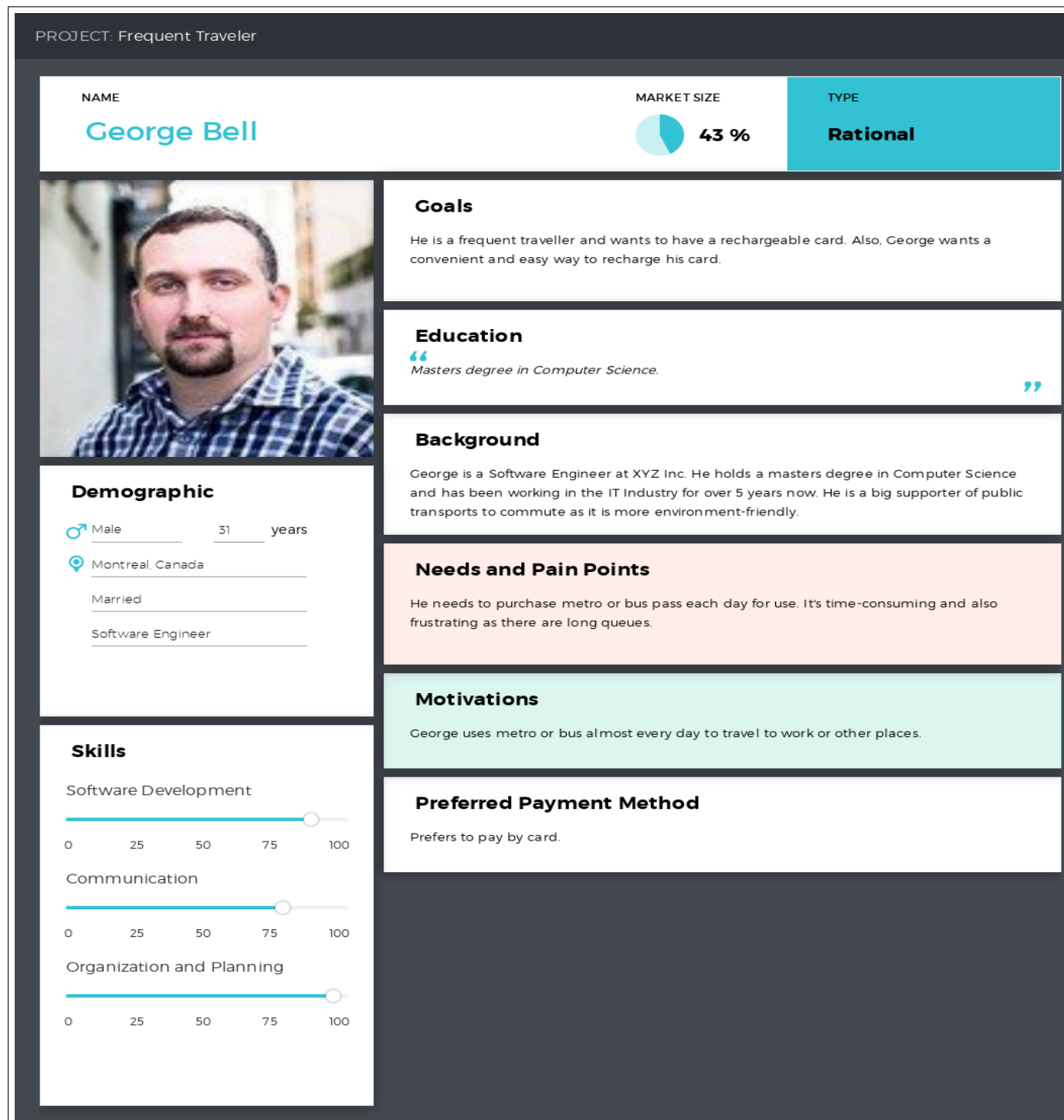


Figure 1.5: Persona: Frequent Traveller

1.1.6 Visually Impaired

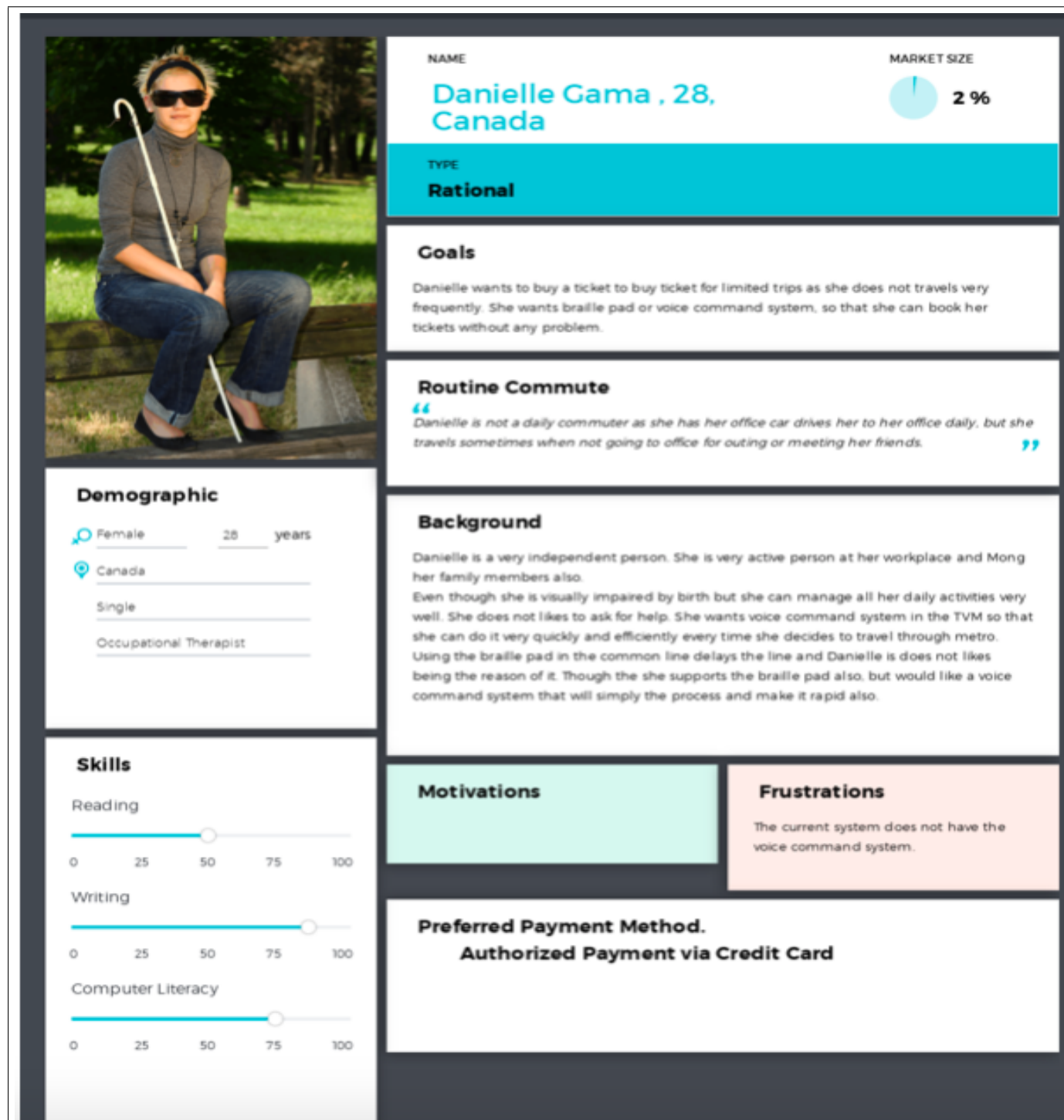



Figure 1.6: Persona: Visually Impaired


1.1.7 Differently Abled



NAME

Jon Russell, 52, Canada


MARKET SIZE

 5 %

TYPE


Rational

Demographic

 Male

52

years

 Canada

Married

Customer Service Representative

Goals

He wants to print the ticket anytime and anywhere. He does not want to wait in the lines at metro stations and would prefer a quick and hassle free way to get his tickets.

Routine Commute

“

He is a daily commuter as he works 5 days a week and goes to church every Sunday. The commute from his place to his office is 25 minutes long.

”

Background

John is a retired army general and is currently working as a customer service representative. Due to the nature of his job, John has to travel a lot and he uses a metro pass to go to his work and then back to his place.

John has his own car, but prefers to travel via metro to save the hassle of parking in the downtown area where he currently works.

John is not very fond of crowded places and he hates to wait in lines. He likes the current ticket vending machine, but does not appreciate the hassle of going to metro station to get his card loaded.

Motivations

Frustrations

Skills

Reading



0

25

50

75

100

Writing



0

25

50

75

100

Computer Literacy



0

25

50

75

100


Preferred Payment Method

Figure 1.7: Persona: Differently Abled

10

1.1.8 Negative User


PROJECT: Metro TVM



NAME

Jean Davidson

MARKET SIZE

 5 %

TYPE

Idealist

Goals

He wants get a ticket printed from false payment either by false cash or by unauthorized payment

Routine Commute

Its uncertain. He has no specific destinations as he is homeless.

Background and Behaviors

Samuel is a high school drop out. He has no financial outcome. He has no money to pay for the metro ticket. His parents are away from him because of his behaviors. He has no specific destinations to travel. He may boycott the rules set up in the metro station. He has no technical background to use any kind of automated machines. Since he has no intentions of working and earning for himself. He chooses to do negative activities.

Motivations

TVM should accept the false money or should accept unauthorized cards


Needs and Pain Points


Happy to get the tickets printed free of cost

Proffered Payment method

False money or unauthorized cards

Demographic

 Male 32 years

 Canada

Single

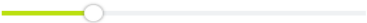
Education: High School

Unemployed

Language: English


Skills

Reading



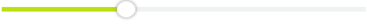
0 25 50 75 100

Writing



0 25 50 75 100

Computer Literacy




0 25 50 75 100

Figure 1.8: Persona: Negative Persona 1

1.1.9 Negative User: Hacker


PROJECT: Metro TVM



NAME

Paul Beck

MARKET SIZE

10 %


TYPE


Rational

Goals

Hacking the system as admin and making major changes in the system

Demographic

 Male 35 years

 Canada


Married

Education: Masters

Occupation: Software Professional


Skills

Reading




0 25 50 75 100

Writing



0 25 50 75 100

Computer Literacy



0 25 50 75 100

Routine Commute

He commutes to understand how the TVM works and how he can hack the system

Background and Behavior

Paul has done his Masters in Computers in a well reputed University. He is very interested in the field of cyber-security. He like researching on these topics. He wants to do some trials on hacking the systems and he is not worried about if he is caught. He works for people who pays him more to do illegal cyber activities.

Motivations

Hacking as a admin to do major changes in the TVM functions

Needs and Pain Points

The cyber security TVM should be taken care

Preferred Payment Method

The user wants to hack the system in such a way that Payments doesn't work

Figure 1.9: Persona: Negative Persona: Hacker

1.2 Problem 5: Global Constraints

ID	Constraint
Performance-G-01	From the time user selects to interact with the system, it takes less than or equal to 5 seconds on average for the system to display the result to that user.
Usability-G-01	User is able to go back to previous step and modify the request.
Accessibility-G-01	Ticket Vending Machine is accessible by users with different backgrounds and abilities by using a screen reader for vision impaired users or people who cannot read/write.
Maintainability-G-01:	Admin can modify system parameters and make changes later, without effecting current functionality of the system
Security-G-01	The server on which the system resides has its own security to prevent unauthorized read and write and delete access.
Privacy-G-01	The information regarding bank card is not saved on the server.
Privacy-G-02	Personal information of registered users is accessible only by authorized people.

1.3 Problem 5: User Stories [4]

Quality of User Stories [1]

Systematic scheme: We have a framework for user stories within the team to describe the user stories. The user story framework gives details about the constraints to be followed, list of acceptance tests and also the inspired user roles and personas.

Characteristics of user stories considered:

I-Investable — User stories are written in such a way that a team should be able to invest their time and resources.

N-Negotiable — Team members are able to discuss around its impacts, edge cases and expected behaviour.

V-Valuable — User stories are with significant business/ technical value into the product.

E-Estimable — User story points are assigned to each user stories based on their effort of development

S-Small — user stories are small enough that a scrum team can deliver within a sprint length.

T-Testable — written acceptance test cases for each user stories, which means they are testable

Individually as well as communally: User stories are independent, we will be able to implement user stories individually. They are communal, which means they are following the same format of description, they are having the same characteristics but different implementations. They are Modular so that they can be integrated and very easy for maintenance.

1.3.1 User Story : Customer Login

Title: Customer Login ID: TVM-01	Priority: High	Estimate: 3 (story points)
As a Quality Commuter I want to login to the TVM system So that I can view my ticket plans		
Constraints: Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02		

Usability-1: Login credential text boxes should be prominently visible on the screen

Acceptance criteria:

Given a commuter interacting with TVM to view ticket plans

When user select the button to login

Then system displays to select a language, and response time is less than 5 seconds

Usability-Test-1: User should find the fields easily to enter credentials

Performance-G-01-Test-1: User interacts with TVM with speed and ease-of-use. Response time should be acceptable (less than 5 seconds).

Accessibility-G-01-Test-1: A user can hear the voice asking for TVM login

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen, Negative user

Personas: George Bell, Susan Kubrock, Sadie Taylor, Jean Davidson

1.3.2 User Story : Select Language

Title: Select Language	Priority:	Estimate:
ID: TVM-02	Medium	2 (story points)
As a commuter I want to select language So that I can interact with TVM system		
Constraints: Performance-G-01, Accessibility-G-01, Maintainability-G-01		

Constraints:

Performance-G-01, Accessibility-G-01, Maintainability-G-01

Usability-1: User should be given list of language options to choose

Acceptance criteria:

Given a commuter interacting with TVM to select known language

When selects the known language

Then system displays the next information in selected language, and response time is less than 5 seconds

Usability-1-Test-1: User should be able to easily select the option in the list

Performance-G-01-Test-1: User interacts with TVM with speed and ease-of-use. Response time should be acceptable (less than 5 seconds).

Accessibility-G-01-Test-1: A user can hear the voice asking for language selection

Maintainability-G-01-Test-1: A user should get the newly added language options to choose

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: George Bell, Susan Kubrock, Sadie Taylor

1.3.3 User Story : Select Ticket Type

Title: Select Ticket Type	Priority:	Estimate:
ID: TVM-03	High	3 (story points)
As a commuter I want to select ticket types (Rechargeable card or Non-rechargeable ticket) So that I can either reload Non-rechargeable card or buy a Rechargeable ticket		

Constraints:

Performance-G-01, Accessibility-G-01, Maintainability-G-01

Usability-1: All ticket types should be displayed on the screen at the same time

Acceptance criteria:

Given a commuter interacting with TVM to select ticket types

When user enter the system to buy a ticket or view ticket plans

Then system displays ticket types for user to select among them

Usability-1-Test-1: A user enters the system and all ticket types will be displayed on the screen for the user to select among them

Performance-G-01-Test-1: A user enters the system and the ticket types will be displayed in less than or equal to 5 seconds for the user to select among them

Accessibility-G-01-Test-1: A user can hear the voice for each text displayed on the output device.

Maintainability-G-01-Test-1: A system Administrator adds a new ticket type without effecting the current functionality of the system

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: Personas: George Bell, Susan Kubrock, Sadie Taylor

1.3.4 User Story : View Ticket Plans for Rechargeable card

Title: View Ticket Plans for Rechargeable card

Priority:

Estimate:

ID: TVM-04	High	5 (story points)
<p>As a commuter</p> <p>I want to view ticket plans on selecting rechargeable card with details and fares</p> <p>So that I can decide what plan is suitable for me to buy</p>		
<p>Constraints:</p> <p>Performance-G-01, Accessibility-G-01, Maintainability-G-01</p> <p>Usability-1: All the plans should be displayed on the screen so that user can compare them together.</p> <p>Usability-2: Information displayed on the screen should be sorted ascending according to fare.</p>		
<p>Acceptance criteria:</p> <p>Given a commuter interacting with TVM to view ticket plans</p> <p>When user select to display ticket plans</p> <p>Then system will display different plans of ticket along with their details and fares</p> <p>Usability-1-Test-1: A user select to view ticket plans and all plans will be displayed on the screen</p> <p>Usability-2-Test-1: A user select to view ticket plans and all plans will be displayed on the screen on ascending order according to ticket fares</p> <p>Performance-G-01-Test-1: A user select to view ticket plans and the result will be displayed in less than or equal to 5 seconds</p> <p>Accessibility-G-01-Test-1: A user can hear the voice for each text displayed on the output device.</p> <p>Maintainability-G-01-Test-1: A system administrator adds a new ticket plan without effecting the current functionality of the system</p>		
<p>Relevant Persona(s) / User(s):</p> <p>Registered Commuter includes: Regular User, Student, Senior Citizen</p> <p>Personas: Personas: George Bell, Susan Kubrock</p>		

1.3.5 User Story : View Ticket Plans for Non-Rechargeable card

Title: View Ticket Plans for Non-Rechargeable card ID: TVM-05	Priority: High	Estimate: 5 (story points)
As a commuter I want to view ticket plans on selecting non-rechargeable ticket with details and fares So that I can decide what plan is suitable for me to buy		
Constraints: Performance-G-01, Accessibility-G-01, Maintainability-G-01 Usability-1: All the plans should be displayed on the screen so that user can compare them together. Usability-2: Information displayed on the screen should be sorted ascending according to fare.		
Acceptance criteria: Given a commuter interacting with TVM to view ticket plans When user select to display ticket plans Then system will display different plans of ticket along with their details and fares Usability-1-Test-1: A user select to view ticket plans and all plans will be displayed on the screen Usability-2-Test-1: A user select to view ticket plans and all plans will be displayed on the screen on ascending order according to ticket fares Performance-G-02-Test-1: A user select to view ticket plans and the result will be displayed in less than or equal to 5 seconds Accessibility-G-01-Test-1: A user can hear the voice for each text displayed on the output device.		

Maintainability-G-01-Test-1: A system administrator adds a new ticket plan without effecting the current functionality of the system

Relevant Persona(s) / User(s):

Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: Personas: George Bell, Susan Kubrock, Gabriel, Mariam

1.3.6 User Story : Select Payment Method

Title: Select Payment Method ID: TVM-06	Priority: High	Estimate: 5 (story points)
As a commuter I want to have the option to pay either using cash or card So that I can move ahead to proceed my transaction		
Constraints: Performance-G-01, Accessibility-G-01, Maintainability-G-01 Usability-1: Both methods should be displayed on the screen so that user can choose according to his convenience. Security-1: The payment should be secured and ask for authorization each time to make sure user's card details are secured and not misused, in case of card payment.		
Acceptance criteria: Given a commuter interacting with TVM to pay for his/her ticket When user select the button to pay for ticket		

Then system displays different payment methods it accepts, and user should be able to pay using any one of them.

Usability-1-Test-1: A user enters the system and both payment methods will be displayed on the screen for the user to select among them

Security-1-Test-1: A user select the card payment method and the system will secure it by asking for authorization each time, making sure the user's card details are secured and not misused

Performance-G-02-Test-1: A user select the payment method and the result will be displayed in less than or equal to 5 seconds

Accessibility-G-01-Test-1: A user can hear the voice for each text displayed on the output device.

Maintainability-G-01-Test-1: A user should newly added methods to choose

Relevant Persona(s) / User(s):

Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: George Bell, Susan Kubrock, Mariam, Gabriel

1.3.7 User Story : Make Cash Payment

Title: Make Cash Payment	Priority:	Estimate:
ID: TVM-07	High	5 (story points)
As a commuter I want to be able to make a payment using cash So that I can purchase ticket and get confirmation receipt		
Constraints: Performance-G-01, Accessibility-G-01, Maintainability-G-01		

Usability-1: System should display information on type of cash denomination accepted and how to enter cash.

Usability-2: The system should dispense the cash back if ticket purchase fails.

Security-1: The payment should be secured and validation of currency and denominations of the cash received should be done.

Acceptance criteria:

Given a commuter interacting with TVM to pay for his/her ticket

When user select the button to make cash payment

Then system displays instruction on how to make a cash payment, validate the currency and denomination and process the cash payment.

Usability-1-Test-1: A user enters cash of correct currency and denomination using cash acceptor. System also displays information on how to make cash payment.

Usability-2-Test-1: System dispenses the money back to user if the transaction fails.

Performance-G-01-Test-1: A user insert cash and the system validates the currency and denominations in less than or equal to 5 seconds

Security-1-Test-1: System validates currency deposited by the user using cash acceptor. System also identifies the fake currency.

Accessibility-G-01-Test-1: A user can hear the instructions on how to make a cash payment.

Maintainability-G-01-Test-1: A system administrator adds functionality to process different types of denominations and currency.

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen, Negative user

Personas: George Bell, Susan Kubrock, Sadie Taylor, Jean Davidson

1.3.8 User Story : Make Card Payment

Title: Make Card Payment ID: TVM-08	Priority: High	Estimate: 5 (story points)
<p>As a commuter I want to be able to make a payment using card So that I can purchase ticket and get confirmation receipt</p>		
<p>Constraints:</p> <p>Performance-G-01, Accessibility-G-01, Maintainability-G-01 Usability-1: System should display information on each step of a card payment.</p> <p>Security-1: The payment should be secured and ask for authorization each time to make sure user's card details are secured and not misused, in case of card payment.</p>		
<p>Acceptance criteria:</p> <p>Given a commuter interacting with TVM to pay for his/her ticket When user select the button to make card payment Then system displays instruction on how to make a card payment, authenticate and process the card payment.</p> <p>Usability-1-Test-1: A user enters card and pin number and system should authenticate and process the payment and each steps information should be shown on the TVM.</p> <p>Performance-G-01-Test-1: A user insert card and enter pin and the system authentication the payment in less than or equal to 5 seconds</p> <p>Security-1-Test 1: A user insert the card and the system will security read the card details and ask for pin to authorize. Card information should be processed by system securely using encryption.</p> <p>Accessibility-G-01-Test-1: A user can hear the instructions on how to make a card payment.</p> <p>Maintainability-G-01-Test-1: A system administrator adds functionality to process different types of cards.</p>		

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen, Negative user

Personas: George Bell, Susan Kubrock, Sadie Taylor, Jean Davidson

1.3.9 User Story : Cancel Seleted Plan

Title: Cancel Seleted Plan ID: TVM-09	Priority: High	Estimate: 5 (story points)
As a commuter I want to cancel the selected plan when I change my mind before payment processing So that I am not charged for cancelling the plan.		
Constraints: Global Constraints Usability-G-01, Usability-G-02, Accessibility-G-01, Maintainability-G-01 Local Constraints Usability-01: There should be a cancel button on the screen.		
Acceptance criteria: Given a commuter interacting with TVM to select ticket and pay for the selected ticket. When user presses a cancel or go to previous menu just before payment processing Then system takes the user back o previous page without charging the user. Usability-1-Test-1: A user decides to buy another ticket then system should show a cancel or go to previous many button.		

Performance-G-01-Test-1: A user presses the cancel or go to previous menu it takes less than or equal to 5 seconds on average for the system to take user back to the previous menu or cancel the transaction.

Accessibility-G-01-Test-1: A user can hear the voice for each text displayed on the output device.

Maintainability-G-01-Test-1: A system administrator adds a new ticket type without effecting the current functionality of the system

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: George Bell, Susan Kubrock, Sadie Taylor

1.3.10 User Story : Print Receipt

Title: Print Receipt ID: TVM-10	Priority: High	Estimate: 5 (story points)
As a commuter I want to get a receipt printed after every transaction I complete So that I have a proof of the transaction with me.		
Constraints: Global Constraints Usability-G-01, Usability-G-02, Accessibility-G-01, Maintainability-G-01 Local Constraints Usability-01: There should be a print receipt button on the screen.		

Acceptance criteria:

Given a commuter has bought a ticket from the TVM
When gives command to get printed receipt for the transaction
Then system gives user a printed receipt.

Usability-1-Test-1: A user decides to get a printed receipt for completed transaction.

Performance-G-01-Test-1: A user presses the print receipt button and it takes less than or equal to 5 seconds on average for the system to give user a printed ticket

Accessibility-G-01-Test-1: A user can hear the voice for each text displayed on the output device.

Maintainability-G-01-Test-1: A system administrator adds a new ticket type without effecting the current functionality of the system

Relevant Persona(s) / User(s):

Unregistered Commuter, Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: George Bell, Susan Kubrock, Sadie Taylor

1.3.11 User Story : Card Payment Fraud

Title: Check for payment card authorization	Priority:	Estimate:
ID: TVM-11	High	8 (story points)
As a fraud I want ot use debit or credit cards with fake account and fake balance So that payments are accepted		
Constraints:		

Performance-G-01, Maintainability-G-01

Security-1: Card inserted to the TVM by the commuter should be checked for validity with the bank

Security-2: Security Pin entered by the commuter should be checked whether it is valid with the bank database

Usability-1-Test-1: The payment approval should be within 10 seconds soon after the user enter the pin

Acceptance criteria:

Given that commuter inserts bank card

When user enters amount and security pin

Then system will check bank card validity and displays result to the user

Security-1-Test-1: User can see the message of payment authorization from the bank

Performance-G-01-Test-1: If the pin is correct the payment approval result will be displayed in less than or equal to 5 seconds

Usability-1-Test-1: The payment approval should be within 10 seconds soon after the user enter the pin

Maintainability-G-01-Test-1: A system administrator adds a new card payment constraint without affecting the current functionality of the system

Relevant Persona(s) / User(s):

Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: George Bell, Susan Kubrock, Paul Beck, Jean Davidson

1.3.12 User Story : Hacking TVM admin login

Title: Hacking TVM admin login

Priority:

Estimate:

ID: TVM-12

High

8 (story points)

As a hacker

I want to be able to login as admin by stealing admin credentials

So that admin rights are hacked

Mitigation Constraints:

Maintainability-G-01:

Security-1: The URL used for the admin login will be different

Security-2: The admin login will be with security questions before login

Acceptance criteria:

Given that Admin visits the admin login URL

When admin answers all the security questions

Then admin will be allowed to login to the TVM admin system

Security-1-Test 1: Admin login should not be found or linked with in any of the commuters TVM

Performance-G-01-Test-1: If the security questions are answered right the admin login page will be displayed in less than or equal to 5 seconds

Maintainability-G-01-Test-1: Any constraints added to the admin login should be reflected during admin login

Relevant Persona(s) / User(s):

Registered Commuter includes: Regular User, Student, Senior Citizen

Personas: George Bell, Susan Kubrock, Paul Beck, Jean Davidson

1.4 Problem 6: Traceability Matrix [3]

1.4.1 Traceability Matrix

User Story ID	User Story Title	User Story	Use Case	Constraint
TVM-US-01	Login to TVM	TVM-US-12	TVM-UseCaseModel	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02 Usability-1"
TVM-US-02	Select Language		TVM-UseCase-1: Change Language	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02 Usability-1"
TVM-US-03	Select Ticket Type		TVM-UseCaseModel	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1"

TVM-US-04	View Ticket Plans for Rechargeable card	TVM-US-03	TVM-UseCase-2: View Ticket Plans	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1, Usability-2"
TVM-US-05	View Ticket Plans for Non-rechargeable ticket	TVM-US-03	TVM-UseCase-2: View Ticket Plans	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1, Usability-2"
TVM-US-06	Select Payment Method		TVM-UseCase-4: Make a payment	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1, Security-1"
TVM-US-07	Make a Cash Payment	TVM-US-06	TVM-UseCase-4: Make a payment	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1, Usability-2, Security-1"

TVM-US-08	Make a Card Payment	TVM-US-06	TVM-UseCase-4: Make a payment	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1, Security-1"
TVM-US-09	Cancel Selected Plan	"TVM-US-03	TVM-US-11"	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1"
TVM-US-10	Print Ticket and Receipt	TVM-US-07, TVM-US-08	TVM-UseCaseModel	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Usability-1"
TVM-US-11	Card fraud payment	TVM-US-03	TVM-UseCase-4: Make a payment	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Security-1, Security-2"

TVM-US-12	Hacking TVM admin login	TVM-US-01	TVM-UseCaseModel	"Performance-G-01, Usability-G-01, Accessibility-G-01, Maintainability-G-01, Security-G-01, Privacy-G-01, Privacy-G-02, Security-1, Security-2"
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1.4.2 Traceability Matrix(Extended)

User Story ID	Domain Model	Interview
TVM-US-01	Registered Commuter	"Neerajpreet Kaur - Q6, Smitha Patil - Q6, Sahana Anatha - Q6"
TVM-US-02	Language	Smitha Patil - Q3
TVM-US-03	"Ticket: Rechargeable Card, Non-Rechargeable Card"	
TVM-US-04	Fare: Regular, Reduced	
TVM-US-05	Fare: Regular, Reduced	
TVM-US-06	Payment: Cash, BankCard	"Neerajpreet Kaur - Q7, Smitha Patil - Q7, Sahana Anatha - Q7"

TVM-US-07	Cash	Sahana Anatha - Q7
TVM-US-08	BankCard	"Neerajpreet Kaur - Q7, Smitha Patil - Q7, Sahana Anatha - Q7, Amandeep Kaur - Q3"
TVM-US-09		"Neerajpreet Kaur - Q4, Q5, Q12, Smitha Patil - Q12, Sahana Anatha - Q11, Q12"
TVM-US-10	Printer, NonRechargeableTicket, Receipt, PaperReceipt	Amandeep Kaur - Q4
TVM-US-11	BankCard	
TVM-US-12	Registered Commuter	

1.4.3 Traceability Matrix(Other Resources)

User Story ID	Other Systems
TVM-US-01	Current STM System " http://www.stm.info/en/info/fares/opus-cards-and-other-fare-media/registered-opus-card "
TVM-US-02	"Current STM System http://www.stm.info "
TVM-US-03	"Current STM System http://www.stm.info/en/info/fares "
TVM-US-04	"Current STM System http://www.stm.info/en/info/fares "

TVM-US-05	"Current STM System http://www.stm.info/en/info/fares "
TVM-US-06	"Current STM System http://www.stm.info "
TVM-US-07	"Current STM System http://www.stm.info "
TVM-US-08	"Current STM System http://www.stm.info "
TVM-US-10	"Current STM System http://www.stm.info "

1.5 Problem 7: Implementation Document

1.5.1 Implementations - User Story: TVM-US-01

As a Commuter, I want to be able to Login to TVM to buy a ticket.

Implementation

Instructions of Use

- Extract the Zip folder.
- Click on the Login.html page
- It will take you to the login page.
- Since we don't have a database access so the user can enter any name and password, but cannot leave them empty
- So please use any name and password to login.
- After logging in, it will take you to the Welcome Page.



Figure 1.10: User Story: TVM-US-01

DOM: The implementation is done using the document object model of various HTML elements. Elements are logically connected with each other and pass the values to verify the sequential alignment of all the elements and their corresponding functions.

Data Structures: The user is able to login into the system with a given username and password Since we are not considering any database for the TVM application back end. The user will be able to login with a one user name and password only.

Programming Platform: HTML 5 and Javascript

User Interface: Textual

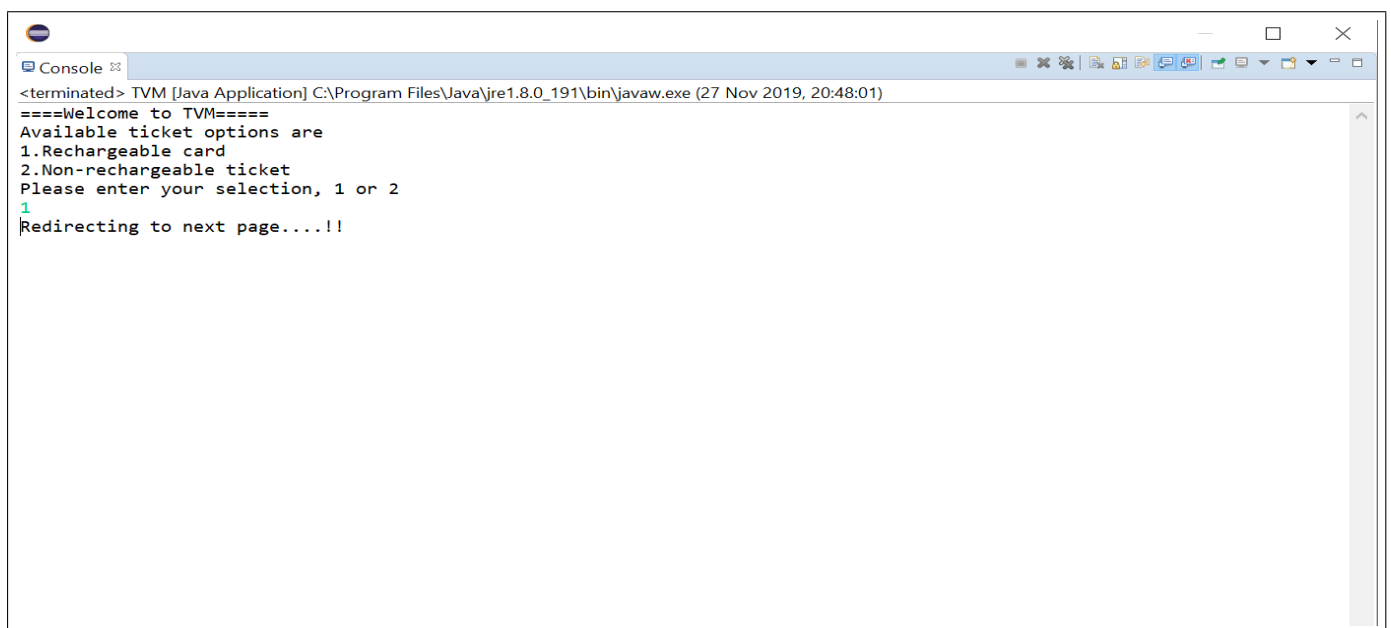
Constraints covered: Usability-G-01

1.5.2 Implementations - User Story: TVM-US-03

As a Commuter, I want to be able to select ticket types (Rechargeable card or Non-rechargeable ticket), so that I can either reload Non-rechargeable card or buy a Rechargeable ticket.

Implementation

Instructions of Use The TVM simulator for selecting ticket type will begin with the login and the displaying the ticket plans. Then the user is asked to select ticket types (Rechargeable card or Non-rechargeable ticket). If user inputs 1, Rechargeable card is selected, if user selects 2 a Non-Rechargeable ticket is selected.



```
<terminated> TVM [Java Application] C:\Program Files\Java\jre1.8.0_191\bin\javaw.exe (27 Nov 2019, 20:48:01)
====Welcome to TVM====
Available ticket options are
1.Rechargeable card
2.Non-rechargeable ticket
Please enter your selection, 1 or 2
1
Redirecting to next page....!!
```

Figure 1.11: User Story: TVM-US-03

DOM: Since we are not considering any database for the TVM application back end. Basic data structures available in Java are taken. Ticket types are stored in an ArrayList.

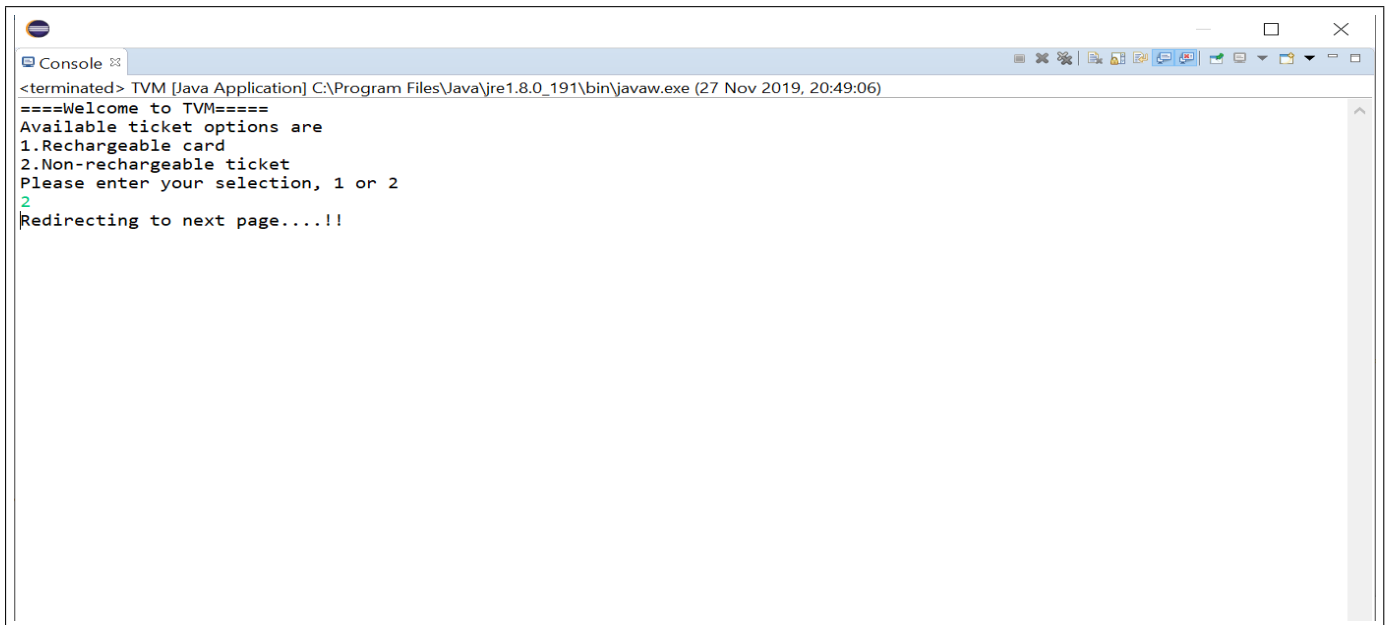
Data Structures: The user is able to login into the system with a given username and password Since we are not considering any database for the TVM application back end. The user will be able to login with a one user name and password only.

Programming Platform: Java Enterprise Edition

User Interface: Textual

Constraints covered: Performance-G-01

User Error Protection: It will be made sure that user provides the right input in required format.



```
<terminated> TVM [Java Application] C:\Program Files\Java\jre1.8.0_191\bin\javaw.exe (27 Nov 2019, 20:49:06)
====Welcome to TVM====
Available ticket options are
1.Rechargeable card
2.Non-rechargeable ticket
Please enter your selection, 1 or 2
2
Redirecting to next page....!!
```

Figure 1.12: User Story: TVM-US-03

Maintainability: Data structures selections are in such a way that any changes to the ticket types can be done.

Learnability: New users will get to know that there are two types of tickets available i.e Rechargeable card or Non-rechargeable ticket

1.5.3 Implementations - User Story: TVM-US-05

As a Commuter, I want to be able to view ticket plans on selecting Non-rechargeable ticket with details and prices, so that I can decide what plan is suitable for me to buy.

This user story is implemented using Java with textual user interface. Since there is not a database so that system can read ticket information from a DB, a HashMap data structure is used to save the information about different ticket plans. Using console input/output user can communicate with the system.

Instruction of Use This program is a Ticket Vending Machine simulator and displays ticket plans with details and fares to TVM user upon selecting Non-rechargeable ticket plans. When user selects the ticket type as "Non-rechargeable ticket" and selects to view ticket plans, this program displays the ticket plans and details to the user. First, the program description and the instruction are displayed to the user, then the list of ticket types is displayed to the user as shown in 1.13

Quality Attribute Constraints [1]

—————(To Exit , Please Enter Q)—————

1. 1 trip
2. 2 trips
3. 10 trips
4. Unlimited Evening
5. Unlimited Weekend
6. 1 day
7. 3 days
8. Weekly pass
9. Monthly pass
10. Group fare

User needs to enter a number between 1 and 10 to view the corresponding ticket fare and description. For example, upon entering 9 user will see this screen:

```
***** Non-rechargeable Ticket Plans *****  
Ticket Type: Monthly pass
```

Fares

Regular fare: \$86.50

Reduced fare – age 6 –17: \$52

Reduced fare students – age 18 and +: \$52

Reduced fare – age 65 and +: \$52

This transit fare is valid from the first to the last day of the month.

Please press Enter to continue and return to the main menu

To continue and return to the main menu user needs to press enter. Then user can select other ticket types and view the corresponding information. The program keeps running until user enter Q to quit the program.

Figure 1.13: User Story: TVM-US-05

Usability: To increase user satisfaction usability quality attribute is considered as follow.

Data Structures: The user is able to login into the system with a given username and password. Since we are not considering any database for the TVM application back end, the user will be able to login with a one user name and password only.

Programming Platform: Java Enterprise Edition

User Interface: Textual

Constraints covered: Performance-G-01

User Error Protection: The input is validated and if it is not a number an error message is displayed to user to correct the input. Also the input is verified to be in the correct range which is between 1 and 10, and if it is not in the valid range, an error message is displayed to the user as follow and user is asked to re-enter the input.

Usability: To increase user satisfaction usability quality attribute is considered as follow.

Maintainability: To increase maintainability, a HashMap data structure is defined which saves different ticket types and fares and details. With this implementation, if new plan needs to be added later, it can be added to the data structure with minimal modification.

Learnability: At the beginning of the program, the type of program and its purpose is displayed to the user and a user manual about how to use the system is displayed as well.

Operability: To make the system operable, system keeps running until user enter "Q" to quite the program. Otherwise user can return to the main menu and view the detail for different ticket types. Also, to make the system understandable for the user, after showing the result of his/her request, the system freezes so that user can see the result. User asked to press enter to continue and return to the main menu.

Accessibility: In this project it is not possible to implement accessibility constraint which is using a screen reader as it needs hardware equipment which is not possible to prepare.

1.5.4 Implementations - User Story: TVM-US-07

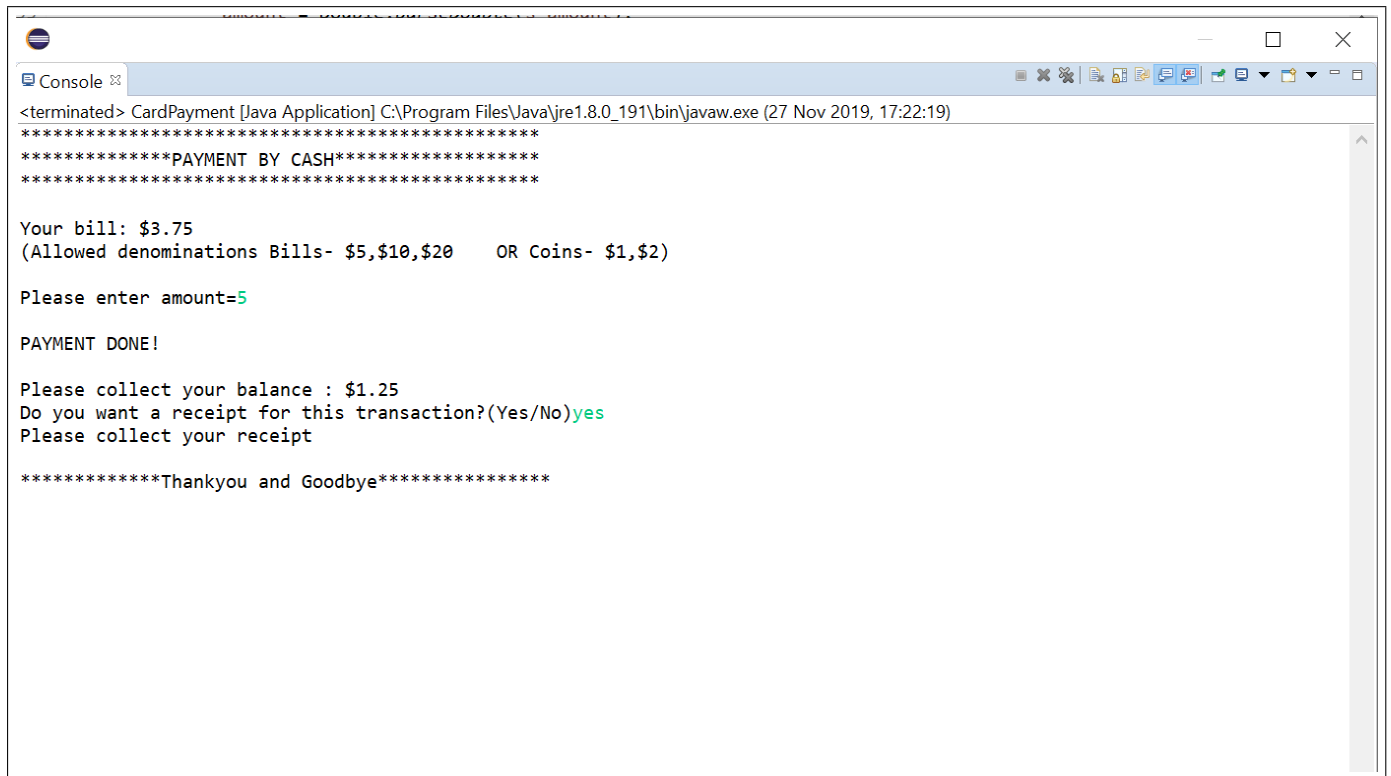
As a commuter, I want to be able to make a payment using cash, So that I can purchase ticket and get confirmation receipt.

Implementation The user story is implemented by using primitive types in which bill is displayed on the screen and user is asked to enter the amount for the cash. Then the user is requested to collect the balance and receipt.

Instructions of Use The TVM simulator for payment by cash begins with displaying the bill. Then the user is asked to enter the amount for the payment. After the successful payment, the user is again asked to collect the balance and if he needs the transaction receipt. The receipt is printed based on the response of the user.

Programming Platform: Java Enterprise Edition

User Interface: Textual



```
<terminated> CardPayment [Java Application] C:\Program Files\Java\jre1.8.0_191\bin\javaw.exe (27 Nov 2019, 17:22:19)
*****PAYMENT BY CASH*****
*****

Your bill: $3.75
(Allowed denominations Bills- $5,$10,$20 OR Coins- $1,$2)

Please enter amount=5

PAYMENT DONE!

Please collect your balance : $1.25
Do you want a receipt for this transaction?(Yes/No)yes
Please collect your receipt

*****Thankyou and Goodbye*****
```

Figure 1.14: User Story: TVM-US-07

Constraints covered: Performance-G-01

User Error Protection: It will be made sure that user provides the right input in required format.

Accessibility: In this project it is not possible to implement accessibility constraint which is using a screen reader as it needs hardware equipment which is not possible to prepare.

1.5.5 Implementations - User Story: TVM-US-09

As a commuter, I want to be able to cancel selected plan, So that I won't get charged and I can make changes later if I want in my purchase.

Implementation The user story is implemented by using primitive types in which user selected plan is displayed to the user with options to "make a payment" or "cancel" the current transaction. Make a payment directs the user to the making a cash or card payment page while the cancel button directs user to homepage.

Instructions of Use

- Extract the Zip folder.
- Click on the PaymentPage.html file and open the file in browser.
- It will open a webpage for cancel functionality.
- The page will display two buttons – “cancel” and “make payment”.
- To make a payment for your selected plan click on “make payment” button and it will take you to the payment mode selection page
- To cancel a payment, click on “Cancel” button which will take you to the homepage of TVM.

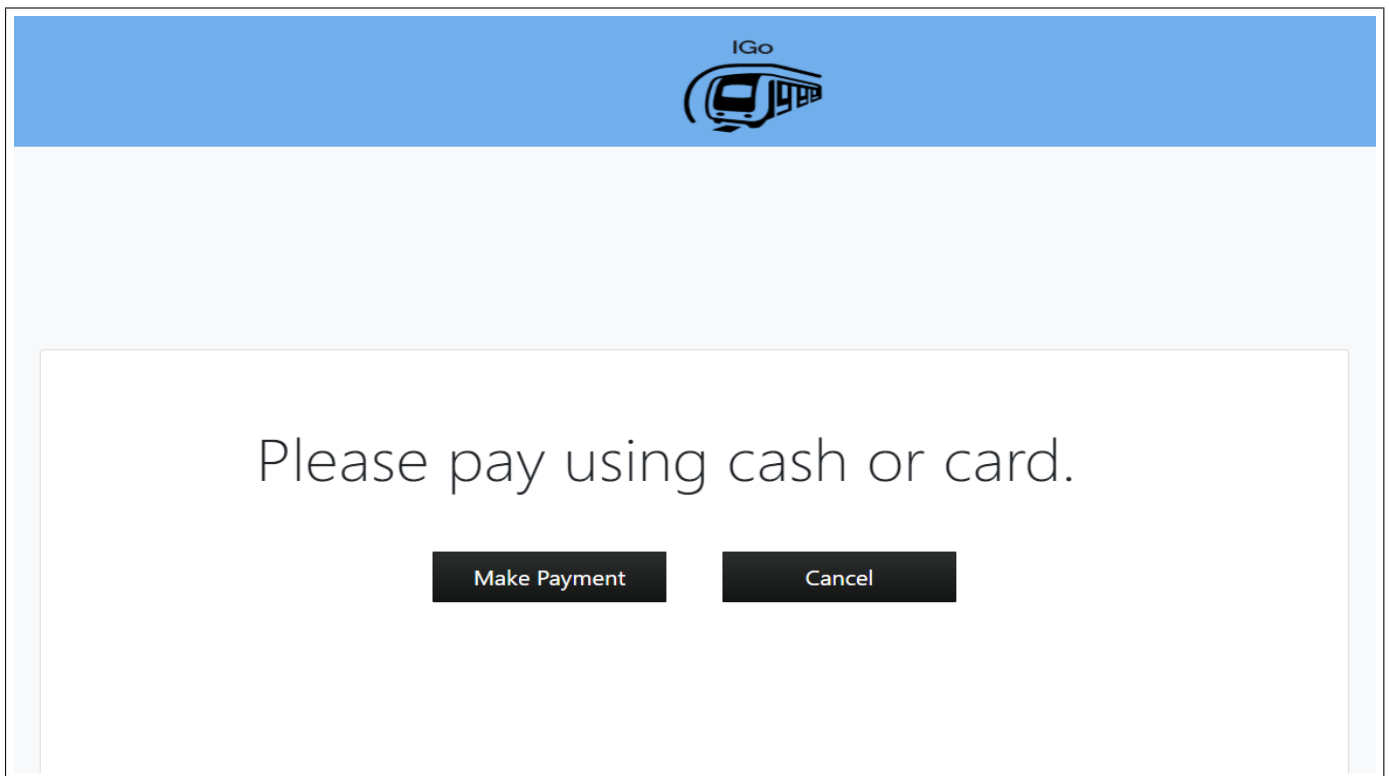


Figure 1.15: User Story: TVM-US-09

Programming Platform: HTML, CSS, Bootstrap

User Interface: Textual, Graphical

Constraints covered: Performance-G-01

Quality Attribute Constraints

User Error Protection: It will be made sure that user provides the right input. At this screen the system has only 2 active buttons on the GUI that is either move to payment screen or cancel the transaction. No other input from user will be considered.

Maintainability: The system does not depend on other modules for data and can easily be modified as per the future requirements.

Learnability: User will be displayed only the necessary interaction components on the GUI. By hiding irrelevant details on payment selection screen makes it easier for user to navigate to the other steps.

Accessibility: In this project it is not possible to implement accessibility constraint which is using a screen reader. Also there will be a 3.5mm jack provided on the tvn for the visually impaired users which is also not possible to demonstrate here as it is hardware dependent.

References

- [1] Pankaj Kamthan. *Introduction to Software Product quality*. 2019.
- [2] Pankaj Kamthan. *Introduction to User Modeling*. 2019.
- [3] Pankaj Kamthan. *Traceability in Software Requirements*. 2019.
- [4] Pankaj Kamthan. *User Stories in Context*. 2019.

Glossary

Administrator Electronic Method of Payment. 17

Modular Is a approach that subdivides a system into smaller parts called modules. 14

Non-Rechargeable Card One time use and throw card.. 32

Quality Commuter Someone who is using the transport service to travel. 14

Rechargeable Card A card that can be recharged to be used monthly, weekly.. 32

Ticket Vending Machine Ticket Vending Machine. 13

A Appendix

A.1 Interviews

Users are Interviewed and the results are accessible at: <https://github.com/m3hrn4z/SRS>