AUTOMATIC TICKETING MACHINE

DELIVERABLE 2

By

AKINRINADE, Oyeyemi Akintoyese (ID: 27017766)
MAKKAR, Gagandeep Kaur (ID: 26613748)
Gagandeep Kaur (ID: 27683731)
BANIK, Biswajit (ID: 26831419)
LIN, Xuefei (ID: 27312377)

A submission in partial fulfillment

of the requirements of

COEN 6312

February 8, 2016

TABLE OF CONTENT

List of Figures

List of Tables

1.0 DOMAIN DESCRIPTION

1.1 Project Background

Public transportation plays an important role in the economy of any country and this in turn depends to a great extent on the citizens' approach to it. In many countries, ticketing process is operated by inspectors and conductors which is known as manual fare collection system. Usually, issuing ticket in booths is a time consuming process. In order to mitigate the challenges associated with this process introducing an automated ticketing system known as Automatic Ticketing Machine, or simply Ticketing Machine, becomes an imperative solution.

An Automatic Ticketing Machine is a smart machine which generates tickets with the aid of a software system. It is a self-service, interactive machine having a Graphical User Interface, GUI, an electronic payment compartment which is integrated into it to support payment and validation; this includes a card slot that allows the use of credit or debit cards on the machine and keypads for providing necessary input.

It also incorporates a printer and dispenser unit where the user has to pick up the ticket(s) and receipt(s). Moreover, the automatic ticketing machine has a language selection button, selection buttons for the daily (one-way or two-way) tickets. The ATM also supports electronic cards (a.k.a pass) which may be recharged weekly or monthly at rates less than the accumulated tickets rate in a week or a month. This allows passengers to travel every day of the week or month without much worries about the recharge frequency.

In order to complete a ticket transaction, the user is required to perform a series of steps on the machine. First, the user must select the language if the default language is not his/her preferred language, after which the selection of one of the many ticket types is required and payment is made either by cash or a credit or debit card. After the payment is confirmed the machine generates the ticket(s) for the passenger.

The ATM also provides additional services of interfacing and interacting with the banking system and intermediary financial institutions who make the electronic mode of payment possible. We may refer to its architecture as a Service Oriented Architecture, SOA.

The ATM system can be broadly divided into the following four (4) partitions:

- Monitor display or Graphic User Interface which reflects the different actions performed by the user.
- Keypad (and touch screen buttons) for giving instructions and interacting with the system (for selection of the language, entering card details and etc.)
- A Card slot to insert the card to make the payment.
- A Card slot to insert the electronic smart card and recharge.

1.2 Working Order of the Automatic Ticketing Machine

1. Welcome Screen of Automatic Ticketing Machine.
2. Select the language option
3. Select the options on screen:

    A. Buy the tickets

        A1. Inter-city trip
            Intra-city trip
        A2. Select the source and destination
            Select the time of trip
        A3. One way trip (valid for 3 hours/1 day)
            Round Trip (valid for 6 hours/2 days)
            Day trip (entire day, multiple trips)
        A4. Enter the count of tickets

    B. Recharge the Pass (prompt to insert the smart card)

        B1. Monthly Recharge
        B2. Weekly Recharge
        B3. Weekend Recharge

    C. View Details

        C1. Ticket Details
        C2. Personal Details (Identified pass)

4. Show payment amount
5. Make the payment

   Accept Credit card/debit cards/cash
6. Print tickets or recharge the smart card (pass)
7. Prompt to remove card or collect returned cash.

1.3 Stakeholders Description

A stakeholder can be defined as an individual, an organization or a group who is actively involved in the project, who is affected by the project, or who can influence its outcome. Below is the list of stakeholders and their associated priorities:

Code	Stakeholder	Importance	Influence	Priority
S_1	**Sponsor**	High - Provides finances for the project	High - Determines or approves project goals	**Critical**
S_2	**User**	Low - Concentrates on performance, reliability, etc of the product	Low - Uses and provides feedback on the product	**Minor**
S_3	**Project Manager**	High - Manages changing needs and provides guidance to the project team	High - Approves milestones and determines approaches to use in project	**Critical**
S_4	**Software Engineer**	High - Software architecture, requirements analysis, context definition, testing the system, provide required modification for ATM	Low - Understands and applies already determined goals but may advice on them	**Major**

S_5	**Software Supplier**	Low - Supplies the relevant software for project	Low - Understand goals and specification of product	**Minor**
S_6	**Hacker**	High - Can invade and disrupt ATM operations and even steal customer credit card information	High - Exerts a high level of security consciousness on the project team in designing the ATM software	**Major**
S_7	**Bank**	High - They provide guidance and access to customer accounts for cashless transactions	Low - They may influence cost by adding charges for using their services	**Major**
S_8	**Programmer**	High - Execute approved specifications	Low - May advice on certain choices made in the project	**Major**
S_9	**Customer**	High - Regular review of product and provide feedback to reduce risk and ensure effectiveness of the project	High - Schedule and release date and requirements specification	**Critical**
S_{10}	**Competitor**	Low - Motivates speed and quality of product development	High - Product is benchmarked against competitors product	**Major**
S_{11}	**Regulator**	High - Approves adherence to standards	Low - Audits project activities	**Major**

S_{12}	**Quality Assurance Engineer**	High - Ensures that product is consistent with existing standards and specifications	Low - Recommends applicable quality standards	**Major**

Table 1: List of Stakeholders and Associated Priorities

Similarly, presented below is the model of stakeholders' interaction:

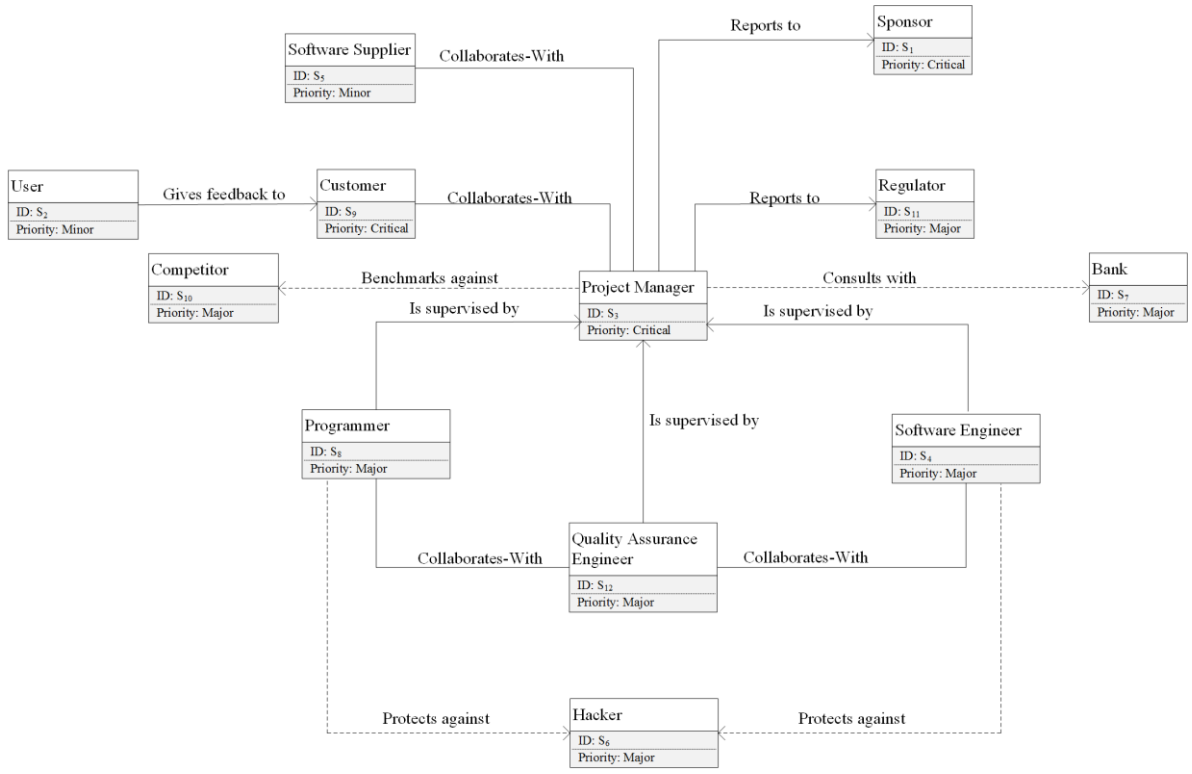

Figure 1: Stakeholders Model

2.0 USE CASE DIAGRAM OF THE SYSTEM

2.1 Use Case Diagram

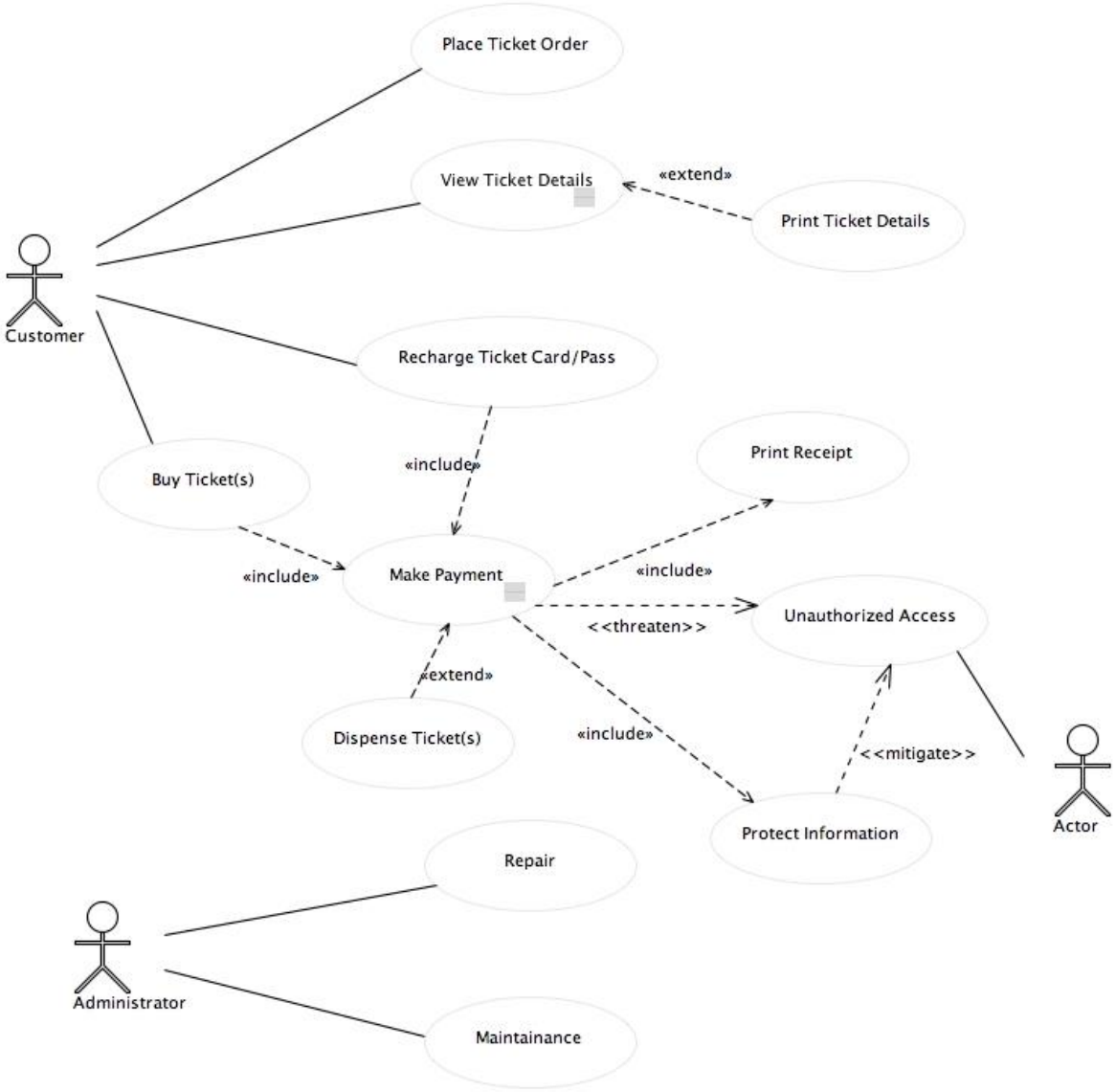

Figure 2: Use Case Diagram of the System

2.2 Use Case Description

The use case of any system consists of two different types of actors:

1. *Primary actors:* These are those actors that play the first action in the system and initiate the use case. For example primary actors for automatic ticketing machine are:

Customer

User

Administrator

2. *Secondary actors:* These actors are basically the supporting actors that help in accomplishing the tasks of the primary actors. These are the second initiators that help in fulfilling the goals.

Hacker

There are several tasks that are authenticated to the actors according to their granted privileges and depending on them the various actions are performed.

2.2.1 Fully Dressed Use Cases:

Name:	Buy Ticket		ID	UC-1
Created By:	Group Skylarks	Date:	5th Feb 2016	
Primary Actor:	Customer			
Description:	The customer initiates this use case to purchase the regular non-rechargeable ticket by indicating the type and number of tickets needed			
Trigger:	Customer indicates that he needs a ticket			
Preconditions:	Pre-1: Operating hours of ATM and train station			
Post-conditions:	Post-1: Information is stored in ATM data base			
Normal Flow	1. Customer selects language for transaction 2. Customer specifies ticket type(s) 3. Customer specifies number of tickets needed 4. Customer creates order 5. Customer makes payment			

Priority	Medium
Frequency of use:	More than 1000 times a day

Table 2: A description of "Buy Ticket" Use Case

Name:	Recharge Ticket Pass		ID	UC-2
Created By:	Group Skylarks	Date:	5th Feb 2016	
Primary Actor:	Customer			
Description:	The customer initiates this use case to renew his rechargeable ticket by indicating the type and number of trips needed			
Trigger:	Customer indicates that he needs a trips			
Preconditions:	Pre-1: Operating hours of ATM and train station Pre-2: Customer has rechargeable monthly pass Pre-3: Rechargeable monthly pass is valid at time of transaction			
Post-conditions:	Post-1: Monthly pass is recharged with purchased trips			
Normal Flow	1. Customer inserts rechargeable ticket pass 2. Customer selects language for transaction 3. Customer specifies trip package type(s) 4. Customer creates order 5. Customer makes payment 6. ATM deposits purchased trips on monthly pass 7. Customer withdraws ticket card			
Priority	High			
Frequency of use:	More than 500 times a day			

Table 3: A description of "Recharge Ticket Pass" Use Case

Name:	View Ticket Details		ID	UC-3
Created By:	Group Skylarks	Date:	5th Feb 2016	
Primary Actor:	Customer			
Description:	Customer checks available number of trips left on rechargeable card on ATM display. He can view his personal details on ticket pass. He can print the details too.			
Trigger:	Customer inserts rechargeable card into ATM card slot			
Preconditions:	Pre-1: Operating hours of ATM and train station Pre-2: Customer has rechargeable monthly pass Pre-3: Rechargeable monthly pass is valid at time of transaction			
Post-conditions:	Post-1: A customer should have a ticket or a ticket pass.			
Normal Flow	1. Customer inserts rechargeable ticket pass 2. Customer selects language for transaction			
Priority	Medium			
Frequency of use:	About 150 times a day			

Table 4: A description of "View Ticket Details" Use Case

Name:	Print Receipt	ID	UC-4

Created By:	Group Skylarks	Date:	5th Feb 2016
Primary Actor:	Customer		
Description:	The customer requests a receipt after making payment for an ordered set of tickets or recharge of monthly pass		
Trigger:	Customer requests for a receipt.		
Preconditions:	Pre-1: Customer has made payment for ordered ticket(s) and trips Pre-2: ATM printer is operational		
Post-conditions:	Post-1 Receipt with transaction details is printed		
Normal Flow	1. Customer requests for a receipt 2. ATM prints receipt 3. Customer collects receipt		
Priority	Medium		
Frequency of use:	About 2000 times		

Table 5: **A description of "Print Receipt" Use Case**

Name:	Print Ticket	ID	UC-5
Created By:	Group Skylarks	Date:	5th Feb 2016
Primary Actor:	Customer		
Description:	After payment of ordered ticket, TVM prints tickets for customer		
Trigger:	Customer makes payment for ordered tickets		
Preconditions:	Pre-1: Customer has made payment for ordered ticket(s)		
Post-conditions:	Post-1: Customer collects the correct ticket(s)		

Normal Flow	1. Customer makes payment for ordered ticket 2. ATM prints ticket(s)
Priority	High
Frequency of use:	More than 1000 times

Table 6: A description of "Print Ticket" Use Case

Name:	Unauthorized Access		ID	UC-6
Created By:	Group Skylarks	Date:	5th Feb 2016	
Primary Actor:	Hacker			
Description:	Hacker breaks into ATM payments information to steal credit/debit card details			
Trigger:	Malicious intentions			
Preconditions:				
Post-conditions:	Post-1: Hacker collects customer information			
Normal Flow	1. Hacker breaches ATM security 2. Hacker accesses customer information data base 3. Customer downloads customer information			
Priority	High			
Frequency of use:	As low as practically possible			

Table 7: A description of "Unauthorized Access" Use Case

Name:	Maintenance		ID	UC-7
Created By:	Group Skylarks	Date:	5th Feb 2016	
Primary Actor:	Administrator			
Description:	Logs into ATM to perform routine maintenance works to ensure reliability			
Trigger:	Maintenance schedule			
Preconditions:	Pre-1: Scheduled maintenance time is due			
Post-conditions:	Post-1: ATM will be operational after maintenance			
Normal Flow	1. Maintenance schedule is due 2. Administrator will log in to ATM and perform maintenance works on it			
Priority	High			
Frequency of use:	Once a month			

Table 8: A description of "Maintenance" Use Case

Name:	Repair		ID	UC-8
Created By:	Group Skylarks	Date:	5th Feb 2016	
Primary Actor:	Administrator			
Description:	Administrator uses diagnostic tools to identify and repair defects and malfunctions			
Trigger:	When ATM breaks down, malfunctions or gives error signal			

Preconditions:	Pre-1: ATM must be malfunctioning or faulty
Post-conditions:	Post-1: ATM will be fully operational after repair
Normal Flow	1. Customer reports that ATM has broken down or is giving error signal 2. Administrator declares ATM to be out of use. 3. Administrator runs diagnostic tests on ATM to identify cause of fault 4. Administrator repairs ATM 5. Administrator puts ATM back to operation
Priority	High
Frequency of use:	As low as possible

Table 9: A description of "Repair" Use Case

3.0 REQUIREMENTS GATHERING

3.1 Requirements Gathering

In order to know the basic requirements of the users, we interviewed two individuals in Montreal. Through their responses we are to gather the main aspects of their requirements and accordingly we are able to construct our use case model.

1. **Interview A:**

Interviewee: Lindasay Catharine George

Part I: User Profile

What is your name?

Lindasay Catharine George

What is your age and profession?

I am 24 and I am an international student in Mcgill

Part II: Knowledge/Experience

How often you use the ticket machine?

a. Once a month.

b. More than 5 time a month.

c. Very often.

d. Never.

Actually, I prefer to recharge my ticket pass at a regular period. Something like that I am a student in Mcgill, and I live near the station Namur which is far from the university, therefore i take metro every day, I think that recharging my ticket pass, the opus card once a month or once in three month is more convenient.

How would you like to make the payment for your ticket pass?

a. Buy tickets in the ticket machine.

b. Online transaction.

c. Call the customer service to make the payment.

d. Other means.

.I don't think there is only one answer for me. Because when I pay for my opus card, I have to go to the metro station and use the ticket machine. When I want to buy a ticket pass for La Ronde, I just open the website of La Ronde and pay for it online, which makes it possible to me to select the type of the ticket. So there are many ways for me to recharge my ticket pass.

Part III: Motivation for "Ticket machine"

What are the important aspects of ticket machines if you choose to use?

If I choose the ticket machines which I prefer to use, I may focus on the functions. It is better that I can recharge my ticket pass by using both electronic cards and cash. I also hope that the

ticket machine can talk with the users, we just need to tell the machine what we need, and then the machine understand us and sell us tickets.

What are the main tasks of the ticket machine have in your mind?

Ticket machines are really important because we use tickets all the time. Some ticket machines are irreplaceable because we can only use the ticket machine to recharge the ticket passes. I always use the ticket machine to pay for my opus card. And I believe that there are a lot of people who don't know how to use the computer and the internet to make the payment.

Part IV: Other questions of ticket machine.

According to you, think of the requirements that you would like to have in a ticket machine?

To be honest, I am so satisfied with the current ticket machines. I can get what I need from the ticket machines, and they do help us well.

Who do you think are the main users of the ticket machine?

As I mentioned before, there are a lot of people who don't know how to use the computer and the internet to get the ticket. They need the ticket machines all the times. On the other hand, I think almost everyone needs ticket machines, because there is no other way to pay for the tickets.

2. Interview B:

Interviewee: Paul Leo Wang

Part I: User Profile

What is your name?

Paul Leo Wang

What is your age and profession?

I am 33 and I am the owner of a depanneur.

Part II: Knowledge/Experience

How often you use the ticket machine?

a. Once a month.

b. More than 5 time a month.

c. Very often.

d. Never.

May be one time in one week. Always in a cinema. I also use the ticket machine in a metro station once in a half year.

How would you like to make the payment for your ticket pass?

a. Buy tickets in the ticket machine.

b. Online transaction.

c. Call the customer service to make the payment.

d. Other means.

I use the ticket machine or purchase at the cash only when I need to get a ticket.

Part III: Motivation for "Ticket machine"

What are the important aspects of ticket machines if you choose to use?

It is a difficult question for me. I only use the ticket machine when I want to watch a movie or I have to take the bus. I don't care how a ticket machine works for people.

What are the main tasks of the ticket machine have in your mind?

A similar question as the previous one. Ok, if I have to say something, I can just say that a ticket machine makes our life easier. The most important task of a ticket machine is to sell us tickets quickly and conveniently.

Part IV: Other questions about ticket machine.

According to you, think of the requirements that you would like to have in a ticket machine?

If I use the ticket machine, I hope that the ticket machine can talk with users. I just need to tell the machine what I need, and the machine can understand us and sell us a correct ticket. Moreover, I would like to select the language when I use it because I don't speak English well, I hope I can use Chinese to use the machine.

Who do you think are the main users of the ticket machine?

I can make sure I am not the main user for a ticket machine.

I think the people who often use the metros or the buses may be the main users of the ticket machine. And some people just like me who love to watch movies in cinemas may use the ticket machines a lot.

4.0 SCOPE AND SYSTEM REQUIREMENTS

4.1 Project Scope

This project shall address the challenges associated with the manual approach to ticketing and pass recharge process. The process will be fully automated, interactive and user-friendly. Our design shall be limited to the ticketing machine itself; the architecture of all other interfacing processes between the physical machine and the financial services institutions involved in completing the payment(s) are beyond the scope of this project and as such shall not be addressed in details.

4.2 Specification of System Requirements

4.2.1 Functional Requirements

Listed below are the functional requirements of the system:

- Customers may buy regular tickets or recharge their electronic pass.
- Customer specifies the type of ticket required.
- For regular tickets customer have the flexibility to choose the number of tickets required.

- In case of recharging a pass the customer has to insert the pass and select the desired subscription – week or month.
- Customer enters the purchasing order.
- Customer reviews the details of the ticket and price.
- If the details of the ticket do not satisfy the customer (for example, if the customer entered a wrong destination) the ticket can be cancelled.
- Otherwise if all the details provided are correct then the customer can proceed to order required tickets.
- In order to successfully buy ticket the customer has the option to pay through card or cash.
- If the amount is payed through card then the customer has to insert the card and press the purchase button.
- Otherwise the customer can pay cash amount for purchase.
- If the payment is successful the ATM machine will dispense the ticket and print the receipt.
- The administrator can login to the system through the user name and password.
- If the user name and password are authorized, the administrator can perform repair and maintenance.
- The ATM machine can be easily updated, and delete information about the destinations and price information.
- The system can run under all environmental and climatic conditions (rain, snow, summer heat etc.) and have a modern graphical user interface, GUI.
- The system is easy to extend with new functionality
- The system has an Internet connection to enable card payment or verify administrator from Internet.
- The system has time limit to complete purchase (for example, 3 mins).

4.2.2 Non-Functional Requirements

The system should be capable of fulfilling the following non-functional criteria:

- Accessibility - all customers can access this system (including physically challenged people, by wheel chair).
- Availability - the availability of the system should be 24/7.

- Certification - the system should be secured for payments (certified.)
- Deployment - the system can be easily deployed.
- Documentation - the system should be well documented and organized.
- Efficiency - the system should perform its task quickly.
- Maintainability - the system should be easy to maintain.
- Modification ability - the system should be able to modify the functions, price of the ticket information etc.
- Operability - the system should be easy to use by any customer irrespective of their educational background.
- Performance - the system performance should be well accepted by all users.
- Privacy - the system should be secured for performing payment operations.
- Quality - the system should perform the following tasks: faults discovered, faults delivered, fault removal efficacy.
- Reliability- the system should be reliable (e.g. mean time between failures – MTBF, or availability)
- Response time - time taken by the server to respond to the user's request should be short.
- Stability - the system should be stable enough (minimal crash during operation).
- Supportability - the system should provide support to the users that will eventually help them from making wrong inputs (invalid destination etc.)
- Testability - the system should be easily testable.
- Usability - the system should be easy to use and handle by different users.

4.3 Summary of Deliverables

4.3.1 Project Deliverables

Team formation document, Domain analysis and requirements including the scope statement, Class diagram, State Machines, Code generation, Final project presentation, Final project report, Lessons-learned report, and any other documents required to manage the project.

4.3.2 Product-Related Deliverables

Listed below are hypothetical deliverables expected in the product:

- Research reports
- Software specifications and design documents
- Contract documents
- Software code
- Hardware

4.3.3 Project Success Criteria

Completion of the project within stipulated time, budget and scope and satisfaction of all stakeholders will be the criteria for success on this project.

GLOSSARY

Term	Description
Stakeholders	a person, group or organization with an interest in a project or somehow related with the effects of the project.
Frequent Users	is someone who frequently uses the system and already have a ticket for recharge.
Casual Users	is someone who uses the system for single trip or short trip.
Context Factors	are those external factors that broadly affect the system as well as the performance of the system.
Documents	Printed receipt of the purchased ticket.
Online Transactions	is the process of making online payments through debit or credit card depending on the convenience of the users.
Plan	Frequent users have the option to choose monthly or some number of trips for recharge the ticket.
Payments	amount that is being paid by the users of the ATM machine depending on which plan they choose.

REFERENCES

[1] http://www.usability.gov/how-to-and-tools/methods/use-cases.html

[2] https://openlibrary.org/

[3] http://www.wikipedia.org/wiki/Digital_Library

[4] http://www.volere.co.uk/template.htm

[5] https://www.draw.io/

[6] Craig Larman Applying UML and Patterns Practice Hall, 2005

[7] http://www.site.uottawa.ca/~shervin/courses/seg4105/project/SRS.html

[8] http://www.nyu.edu/classes/jcf/g22.2440001sp10/handouts/Assignment1SampleSolution.pdf

[9] https://en.wikipedia.org/wiki/Use_case