

# **E-Ticketing Management System**

## **Via Quick Response Code**

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## **Abstract**

**Background** Organizations and business, from time to time create and event or a conference, currently the only method being used is social media for advertising the event while traditional methods of paper tickets are still in use. E-tickets can save various amount of printing paper but most importantly also cost. With cloud systems backing up security computer and lowering the fail rate to nearly 0%, e-tickets are looking more and more useful and at the same time secure. With the help of email, an e-ticket is stored away in a user's account safely. Verification is made very simply with databases online with airline companies being one of the first in the market to support e-ticketing, the technology has taken a turn. Now with the recent events of Quick Response technology, combining that with e-ticketing and having support on a mobile handset. You have an actually digitized electronic ticket. The possibilities on using the combination of mobile and QR codes are endless in market and advertising. NFC is great contender in the connectivity technology. However, QR code technology is most expressed in the advertising and marketing industry while NFC has proven to be the most sufficient method of mobile payment.

**Conclusion** Creating a solution that runs on mobile which manages events and tickets thus making event management much easier and remove the necessity for managers to buy extra devices to scan tickets along with other benefits. The solution is currently the most appropriate approach to the problem.

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## **List of Abbreviations**

- API - Application Programming Interface
- ASP - Active Server Pages
- B2B - Business-to-Business
- B2C - Business-to-Consumer
- CMP - Contactless Mobile Payment
- CRM - Customer relationship management
- GSM/GSMA - Global System for Mobile Communication
- IT - Information Technology
- IS - Information Systems
- KB - Kilobyte
- NFC - Near Field Communication
- P2P - Person-to-Person
- QR code - Quick Response code
- RFID - Radio Frequency Identification
- SaaS - Software as a Service
- SEPA - Single Euro Payments Area
- SIM - Subscriber Identity Module
- SMS - Short Message System
- UI - User Interface
- UML - Unified Modeling Language
- WAP - Wireless Application Protocol
- XML - eXtensible Markup Language

## **Preface**

This document explains in detail 2D codes, their place in today's market, and one example of the collaboration between information systems and mobile handsets and the implementation of 2D codes. I have chosen this topic because I believe from a through reading of articles and papers, the future of ticketing systems exists in an electronic form, not in paper as it is today. We will see example in further detail as we go along the paper, example in Korea's train station and in Japan. Seeing how technology has vastly improved in these countries, it has pushed me into trying to come up with a technology or at least implement that technology to the current system into a developing country such as Albania.

## **Chapter 1**

### **Introduction**

**Research purpose:** The sole purpose and aim of this thesis research paper is to drive businesses and end users alike to adapt to a new method of using QR Code technology alongside e-Ticketing Management Systems whilst increasing awareness of its technological benefits.

**Research method:** In this study a quantitative research method was chosen, by applying quantitative content analysis.

I have chosen to research the Quick Response technology because of the following factors:

- Ease of implementation
- Portability
- Security
- Open Source License

#### **1.1 Background**

Quick-response code or QR code for short is a two dimensional barcode symbol invented in 1994 by Denson, a major Toyota group company. Originally this 2D code was invented to speed up production control of automotive parts. Today, it has spread and implemented worldwide and in other fields of study, such as in the smartphone industry, and more specifically, as a marketing tool for premium brands.

One of the reasons that made QR codes so popular is the fact that Denso released the patent for public domain, meaning that everybody can use QR codes free of charge. Moreover, this code supports a much higher data density, which enables the access to the Internet simply by reading an URL (Uniform Resource Locator) encoded in the QR-code. As mentioned by Filipe Miguel Álvaro de Lima [1] the code or symbol itself is made up of black modules (black squares) arranged in a square pattern on usually white background. The information encoded inside a QR code can be made up of four default kinds of different data (numeric, alphanumeric, byte/binary, Kanji), or through supported extensions plugins.



**Figure 1.1. A QR (Quick Response) Code**

Management information systems are on the rise and today what is missing in Albania at this current state is precisely that. No tickets, events or information regarding a person attending an event is not tracked or registered. An online system that can allow an administrator to manage and track analytical statistics would make the job easier and more professional. Logs would create a transparent window open to managers.

Analysing the transportation and ticket management areas of Albania, with the purpose and intentions of developing an application that will allow

managers/organizers to implement QR code technology into their business and organizations. Thus making it easier and more secure whilst pushing end users to understanding electronic ticketing mobile technology. QR Technology has proven to be quite useful in the fields of marketing, ticketing, shopping, environmental messages, mobile strategy, brand advertising and many more.

Using QR technology and implementing it within the application I will create. This application will be compiled initially for Windows Phones. It will be available to event organizers and managers who manage the entrance of a venue.

I will be building an online e-ticketing management system that is an information system but working alongside a mobile app, this will be mostly managers/organizers hosting an event, conference, seminar etc. With this app, managers and organizers will be able to scan, create and verify tickets.

## **Chapter 2**

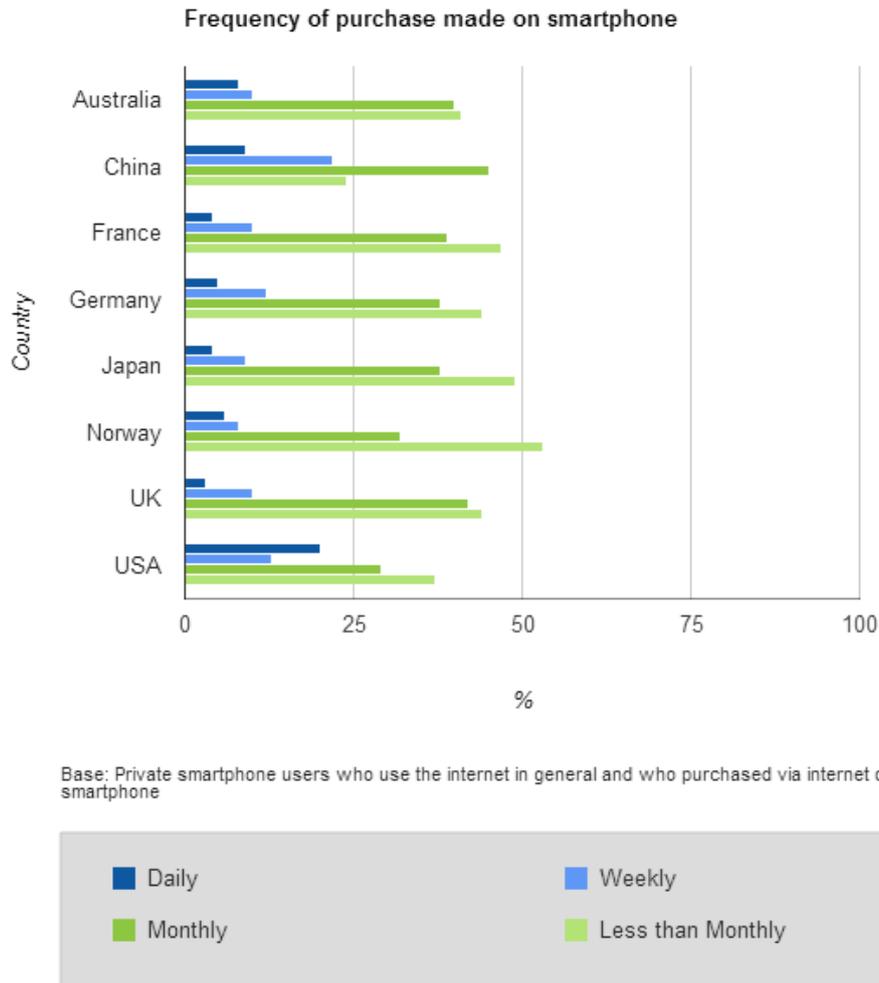
### **Literature Review**

#### **2.1 Social shaping of technology**

E-Ticketing is a new form of managing tickets online whether for an event or a transportation system. Introduced as concept in YEAR, many did not agree until the great expansion of the internet, in nearly every office and every home, especially in all mayor developed countries. As discussed by Harte Hanks [2], Nowadays e-ticketing is becoming more and more popular thanks to smartphones and many other connected devices. An example would be a company known as Eventbrite, this company provides organizers to manage and create electronic tickets online. Another example would the use of QR technology and e-Ticketing in Antalya, Turkey. Bus companies may install a QR/RFID reader which enables passengers to pay electronically with either a RFID plastic card or their mobile phone. Helps companies save in printing costs.

#### **2.2 Electronic tickets**

It is explained on the website AsiaTravelTips [3] that the association IATA estimated that electronic tickets save up to 50,000 trees a year by simply not using traditional paper tickets. Also a report by the New York Times [4] claims that in 2007 that 97% all of tickets worldwide are electronic tickets. The first company to issue an electronic ticket was Southwest Airlines in 1994.



**Figure 2**

### **2.3 Mobile Marketing**

As discussed by Filipe Miguel Álvaro de Lima [5], companies focusing on brands have realized that QR Code technology has become of great use for ad campaigns, it increases brand awareness and builds a strong relationship with customers. Filipe conducted a large-scale research on the matter of ads in the fashion market in Sweden with the implementation of QR Code.

The reason why Filipe studied this new mobile technology was to analyse it and get the hang of how the implementation would take effect in the fashion ads of Sweden and relate it to brand awareness along with customer relationship management.

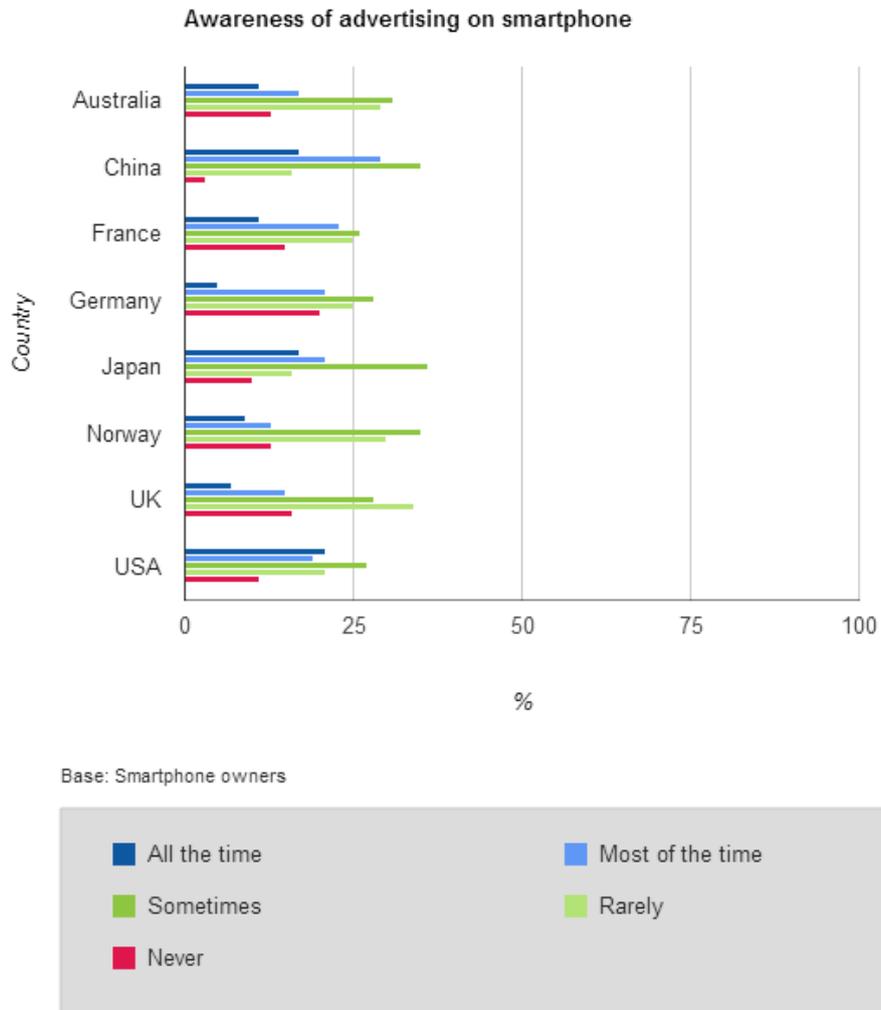
The results of the research concluded that customers have a problem of being aware what QR Code technology is and its use. The research also showed an interesting fact that companies should be taught the importance of implementing a mobile marketing tool within their communications campaigns and strategies. Filipe Miguel Álvaro de Lima [5] also claims he study also had shown that companies or business may increase the awareness of their brands and push customer relationship management if with the proper orientation and proper use, QR code can be a truly innovative addition to the strategies. This will keep the relationship acknowledged between customers and a brand since they are vitally important.

## **2.4 Brand Advertising**

The author realized that brand awareness was a fundamental part for the communication between a company and its customers, without it, customers could not even recognize the brand. The author has also considered that to build a firm and reliable brand, it is required have a “*brand evaluation, an accessible brand attitude, and a consistent brand image*”, and the term “*brand attitude actually refers to what the others term as awareness*” [5].

Thus, it is essential that consumers take into consideration a specific brand, since it also imprints point of views that a customer has over a brand. Whilst in this discussion, the author Filipe Miguel Álvaro de Lima [5] has mentioned that the role of the consideration set is directly entwined with the brand awareness. It is suggested that the purchase intention is high as long as the level of brand awareness is greater;

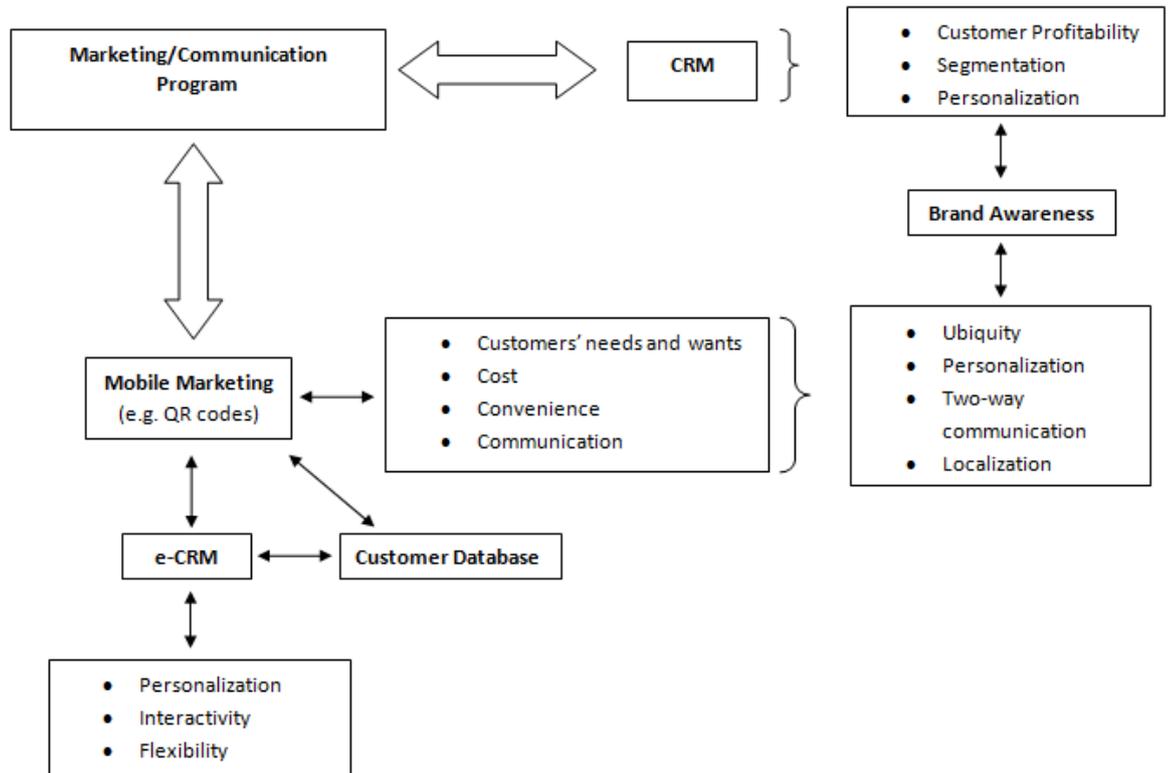
however it is also vital in the decision-making of buying process since it is entwined with the consideration set previously mentioned.



**Figure 3**

As a final remark related to brand awareness, the author explains that no matter what type of strategy is used by the company in marketing, brand aware is considered as being a fundamental goal. It is stated that brand attitude and brand image cannot formed with brand awareness occurring. One of the authors mentioned argues that brand awareness is “one of the four major assets which add value to the product or service and/or its customers”.

In a nutshell, the Filipe Miguel Álvaro de Lima [5] states as a final remark four important points to note when taking into account brand awareness: (1) it places the brand in the consumers mindset; (2) it acts as a barrier when compared to unestablished brands; (3) supporting consumers commitment to a brand and; (4) grants leverage in the distribution channels.



**Figure 2.4. Summary of Mobile Advertising Framework**

## 2.5 Mobile Customer Relationship Management

According to the author Fillipe(), when a definition is proposed for mCRM by researchers, they generally use the approach of technology envision it. He disagrees with this for two reasons: “*firstly, it does not emphasize sufficiently the critical role of communication in establishing and maintaining profitable customer relationships. Second, there is confusion around the terms mobile and wireless*”. [5]

However authors Karjaluoto and Leppäniemi suggest that mCRM is “*communication, either one-way or interactive, which is related to sales, marketing, and customer service activities conducted through the mobile medium for the purpose of building and maintain customer relationships between company and its customers*”. [5]

Authors Karjaluoto and Leppäniemi point out that there are 3 attribute of mCRM that exist because of the specifications of the mobile, they are: “*personalization, interactivity, and flexibility*”. [5]

Before anything else, we begin with the idea of mCRM that a mobile phone belongs to a single person in general and that a specific message can be received without any interruptions. Furthermore, it is very important when communicating through a mobile phone in CRM related to personalization.

As in many cases, in mCRM, yet again we are faced with the issue related to the understanding of the customers’ needs, want and desires by a company. If a company does not understand these mayor points, then the customer becomes unmanageable and invisible. A mobile phone enables the interaction between the 2 points of access and especially where a company and a customer interact though a mobile device.

In a summary, for various reasons, the mobile medium has proven to be unique thanks to its advanced features.

## **2.6 Use of QR Codes in Japan**

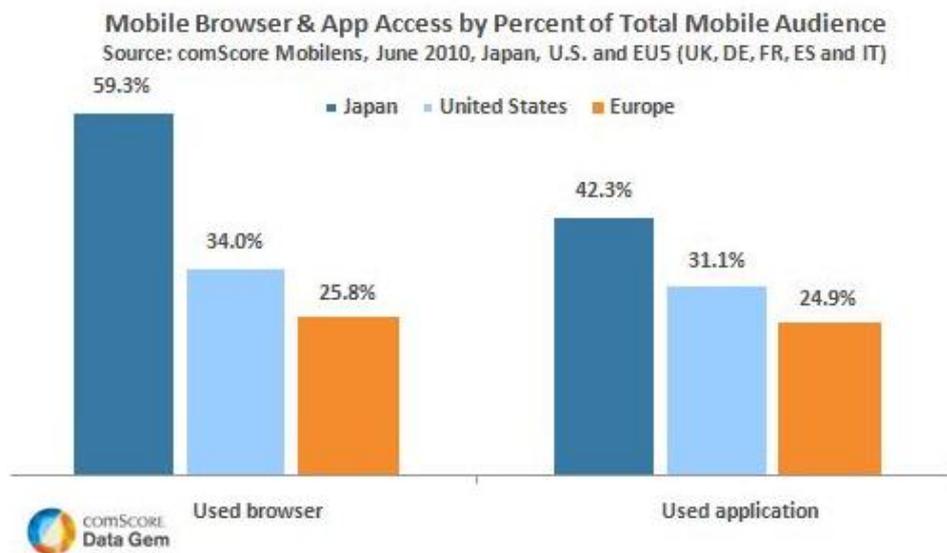
One of the leading countries in technology and especially when it is mobile related technology. A paper by Susanne Fredriksson & Ida Hillerdal [6] explains how they investigated mobile phone usage in Japan and describes the preconditions of

implementing some noteworthy features from the use of Japanese mobile. This was done on two aspects: a social aspect and the technological aspect.

The usage of the mobile phone in Japan is investigated on 3 different levels: the consumer level, the industrial level and the governmental level. First we begin with the governmental level as this is one of the levels that holds the infrastructure and reason of use for advanced mobile technology in Japan. The governmental level is also classified the ICT policy which aims to make technology in Japan pervasive.

On the industrial level we have found that effective design is significant for the mobile phone supply, additionally the mobile phone or smartphone manufactures have weaker position on the mobile market compared to the operators.

And the final level, the consumer level, the paper shows that culture is of great impact on the usage of the mobile/smartphones.



**Figure 5**

At the end of the research, the authors came up with six technologies that relate with the chances of making the same use of Japanese mobile usage in another country,

which are the following: Email and internet on mobile, wallet phone, QR-Code, mobile phone TV, and mobile phone novels. The authors describe that the preconditions for those technologies to work the same way and be of same use in another country are technological and social.

QR code holds a lot more capacity than a traditional barcode and created by the Japanese company Denso Wave. Where this technology distinguishes itself is from the fact that Denso Wave has stated that they have no plans and no intentions of exercising their patent rights and perhaps also the reason why it has been adapted by so individuals and businesses, spreading like wild fire.

According to Susanne Fredriksson & Ida Hillerdal [6] another great feature of QR-code is the possibility of accessing mobile data service. In addition to a camera the mobile phone will need an app or piece of software installed into the device so that scanning may be enabled. The authors have stated the fact that not so many users in Sweden during 2010 did not have the capabilities of scanning a simple QR-code while in Japan it is a totally different scenario. Some users by scanning a QR code they are given coupons, mobile advertisement or sent to a long web address. If a webpage address on an advertising poster may be over 30 characters or too long for a user to remember, then using a QR code to replace that address may be the perfect solution by having the user simply scanning the code and displaying data or information to the user immediately.

## **2.7 Contactless Mobile Payment**

As stated by Rasmus Englund, David Turesson [7] one recent heavily questioned and under major development is the field of mobile payment. On a world wide scale, especially in countries like Latin America, Africa and the most part of the Asian

continent, mobile payment is already being implemented due to reasons of high penetration in the mobile segment, limited banking infrastructure and very few alternative solutions.

Needs for distant money transfers has seen great adaptation and successful implementation. These needs of distant mobile money transfer are however greatly specific and very different when met with the needs found for example in the European market. Thus not making it possible to use the results from these services to launch better and more evolved mobile payment alternatives in the developed world. The author has debated that apart from NFC (Near Field Communication), QR code may also be used for contactless mobile payment even though this technology has not received as much media attention as NFC when it comes to mobile payment. Another reason as to why QR code is a strong candidate to be used with contactless payment is the fact that it is possible to be used with current mobile technology. If the consumer is not equipped with a NFC compatible mobile phone, then the consumer is not able to make a payment or transaction via NFC.

As stated by Rasmus Englund, David Turesson [7] On the other hand the QR code solution only needs a camera feature to operate and all smartphone models develop in these recent years have the camera capability. QR codes are scanned through the camera function of a device and also through software that helps the device recognize the QR code, software such as an app or an application. The author gave one final reason why QR code solutions are a viable approach to contactless payment and that was the bypassing issues regarding the complexity of the NFC ecosystem.



**Figure 2.6. NFC Scanner**



**Figure 2.7. A QR code scanner**

## **2.8 2D-Codes**

In agreement to what Per Johnsson claims [8], the evolving of technology has produced ground breaking development when it comes to the mobile phone and its capabilities. These capabilities have also made it possible for companies to get in reach of many customers in variety of ways. The author emphasized that the use of 2D codes e.g. QR codes, can influence the decision-making process in the consumer buying behaviour. The results of the author were that the buying process may be influenced with the implementation of 2D codes in any of the first four stages of the decision-making process which are problem recognition, information research,

evaluation of alternatives and purchase decision. He concluded that 2D codes will actually overall simplify the buying process and that there are many alternative ways to implement 2D codes to influence customers and especially regarding information search and the purchase decision.



Figure 2.8. A First Generation barcode



Figure 2.9. A QR code

## 2.9 Technology Diffusion

As reported by Damon Gura [9], the original purpose of barcodes was to speed purchase processing and track inventory, then QR codes were created to replace the initial barcode since they have the capability of storing much more information and data. In the early 1990's, few people owned QR code scanners or readers. Now nearly every mobile phone or device with a camera has the ability to scan a QR code. This is possible also through the downloading of an app or application or through a built-in

feature though not many devices have come with the feature pre-installed. Thanks to smartphones with their rapid market penetration, has advanced the QR code technology a dormant state to commercial worldwide technology. The diffusion of the smartphone has made possible the development of many apps and applications available for QR codes.

## 2.10 Statistics Related to QR Code and Mobile Technology

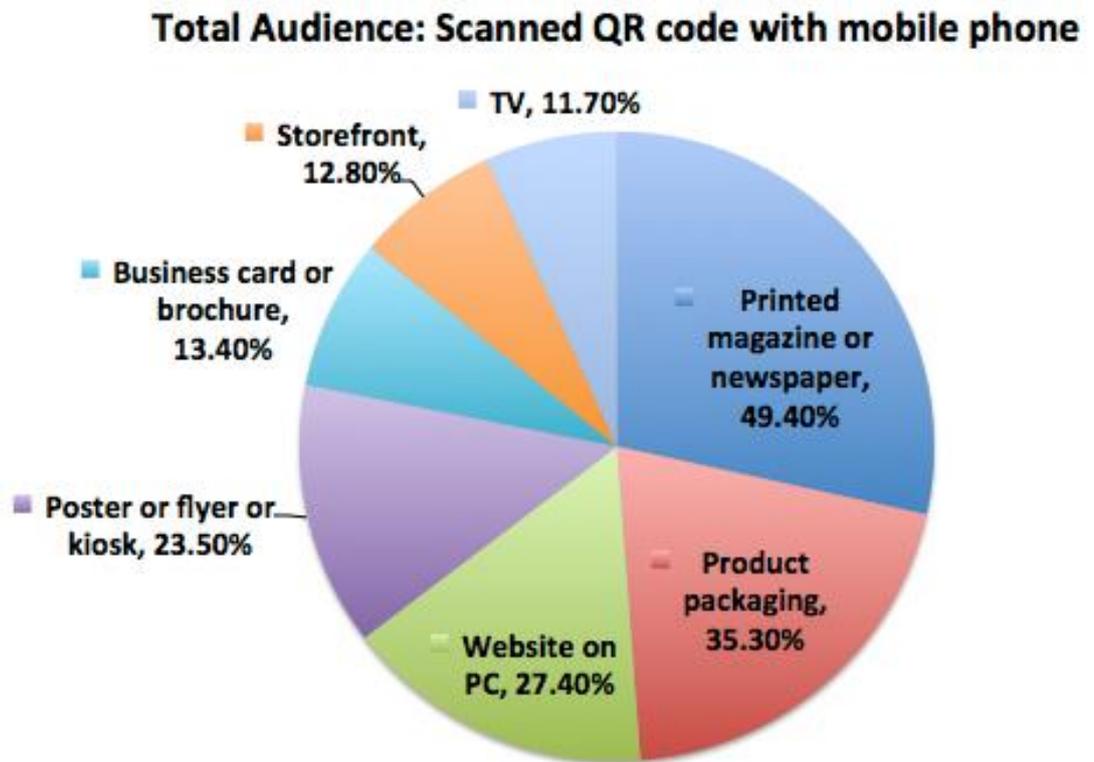


Figure 2.10. Pie Chart for Total Audience of QR Code

[10]

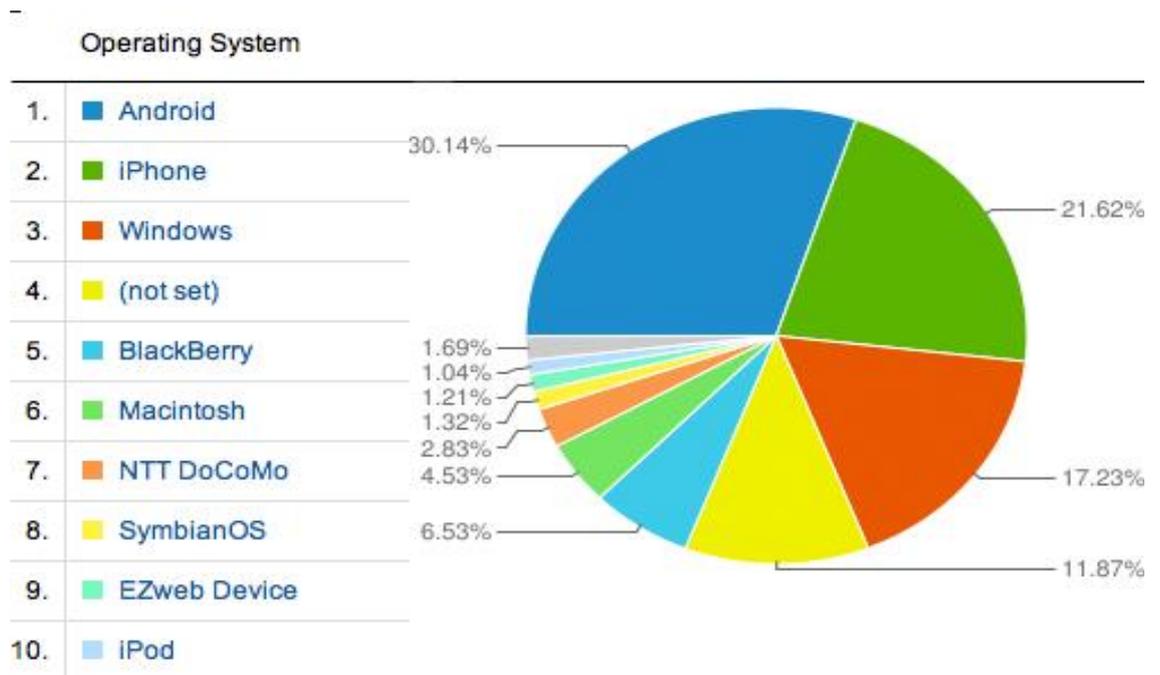


Figure 2.11. Pie Chart with Operating Systems supporting QR Code

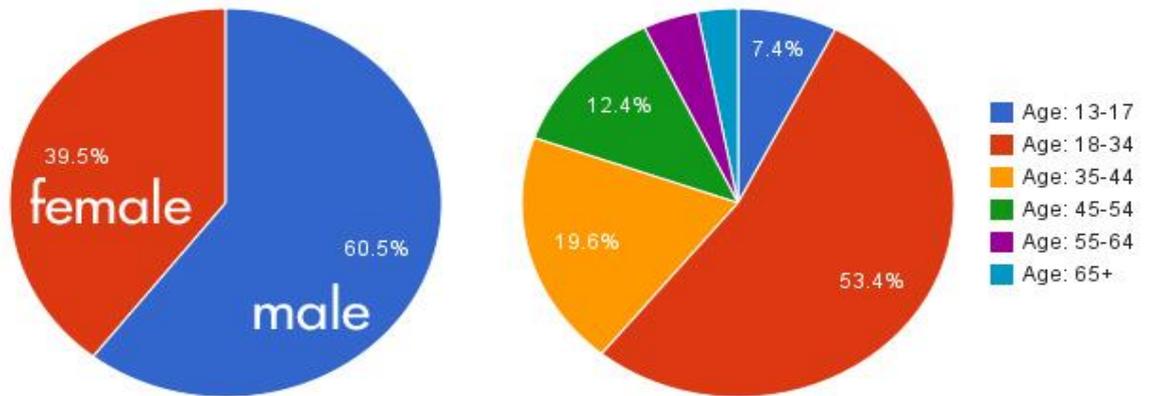


Figure 2.12. QR Code use Pie Chart divided by Age and Gender

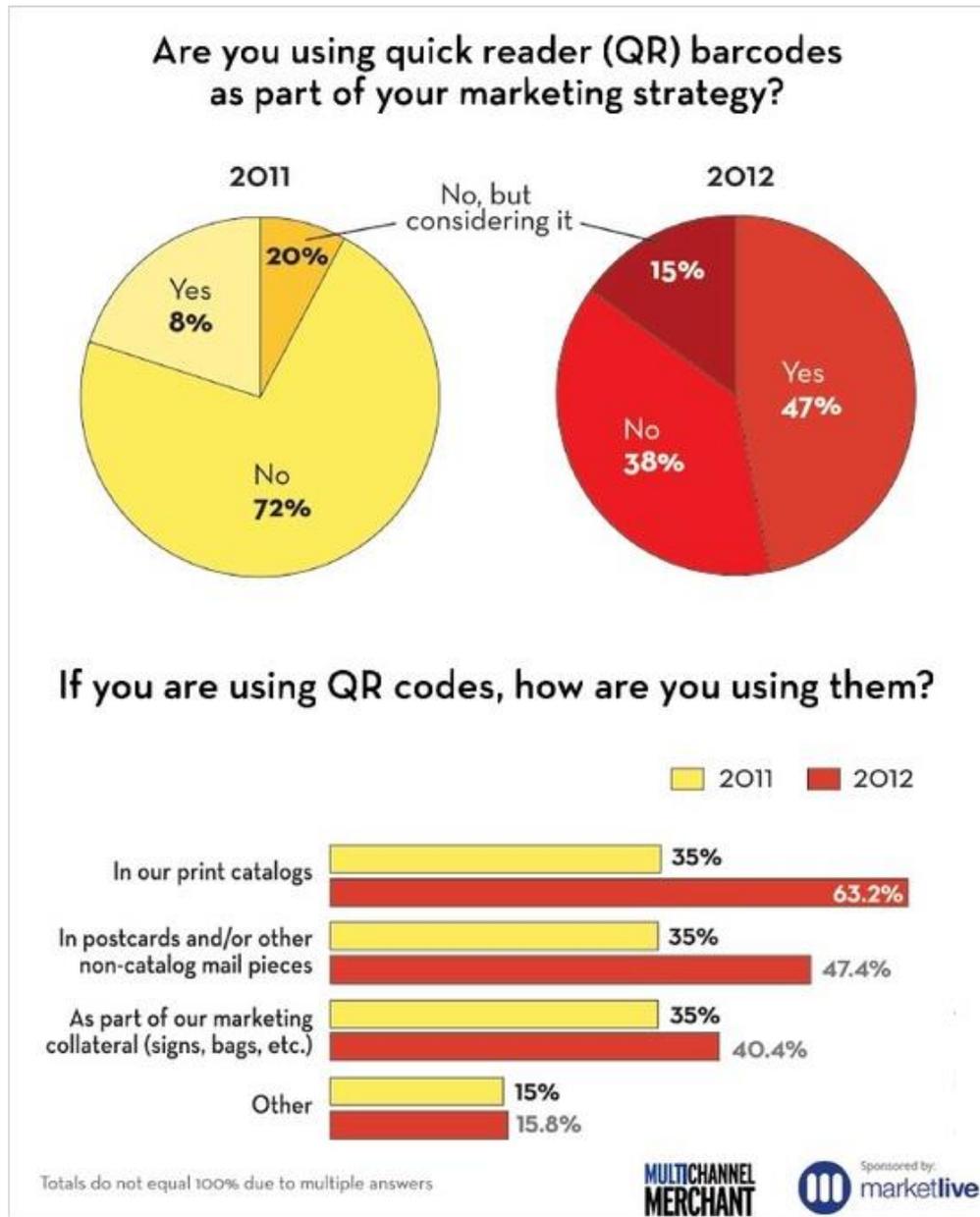


Figure 2.13. Statistics related to market strategy

## **Chapter 3 Methodology**

### **3.1 Problem Formulation**

Online information's system that will be able to manage and generate electronic tickets with the aid of QR Code technology. This information's system will provide the tracking and analytical statistics of an event connected to a user registered in the system.

### **3.2 Research problem one**

Create a Management Information system with tracking and analytical statistics functions of real-time events. Problems still exist in discovering live or events in a real time.

### **3.3 Research problem two**

Come up with an ecosystem friendly and electronic approach to tickets that can also deliver real-time results in cost-effective manner. As tickets are printed, costs for printing increase along with the ticket.

### **3.4 Functional Requirements**

*User Requirement 1. Log In* - Log in (entering) into the system. This will allow the user be it an Administrator, Manager, Registered User to sign in and their personal information and profile settings will be requested from the database.

*User Requirement 2. Log Out* -Log the user out from the system. This will close the session between the logged in user and the eTMS, it close any connections regarding the User and the databases.

*User Requirement 3. Edit Credentials* - Change the username and password. The user should be able to edit or update his password or username to his will.

*User Requirement 4. View event* - View contents of an event. Anyone user even a visitor may view events in the events page. However to order a ticket or view more information about the event, the visitor must register, while if a registered user logs in then they may order a ticket, follow the event and has more actions available.

*User Requirement 5. Edit event* - Modify the content of an event. An administrator or the manager in charge of that event may edit the information or data regarding that specific event.

*User Requirement 6. Delete event* - Delete an inappropriate or old event. An administrator or a manager in charge of that event may remove the event from the events page.

*User Requirement 7. Add new event* - Create/insert a new event to be submitted. The system should be able to provide the administrator or manager/organizer with the ability to add a new event in the events page. This event should then be able to be viewed by all users including even guests.

*User Requirement 8. Add Category* - Creating a new category. The system is to provide the ability to add a new category for sorting types of events. After the category is created and stored in the database, managers may sort their events into specific types.

*User Requirement 9. Edit category* - Editing category. The system built should allow the administrator to modify a category if any updates are needed or if any corrections need to be made.

*User Requirement 10. Delete Category* - Deleting an existing category. The system should allow the administrator to remove a category if it is inappropriate or unused. If any tables are linked to the category in the database they will be moved to another category most appropriate defined by the administrator.

*User Requirement 11. Rename Category* - Rename an existing category. The system should allow quick access to rename a category if needed.

*User Requirement 12. Create new e-ticket* - Insert a new e-ticket into the system. The e-ticket management system should allow the manager or administrator to create tickets from a specific event at will. The ticket will contain information regarding the event and user attending the event.

*User Requirement 13. Edit e-ticket* - Edit an e-ticket in the system. The system should allow a manager or administrator to modify the content of an electronic ticket. The content that is modified relies in the database, thus not giving any errors when the QR code is scanned.

*User Requirement 14. Delete e-ticket* - Delete an existing e-ticket from the system. The system should give the ability to the administrator and manager, the power to remove a ticket from the ticket list. Thus if the QR code is scanned, it will be invalid and the attendee will be refused entrance.

*User Requirement 15. Create new e-VIP ticket* - Insert a VIP new e-ticket into the system. The e-ticket management system should allow the manager or administrator to create VIP tickets from a specific event at will. The ticket will contain information regarding the event and user attending the event and also give premium entrance and seating in the event. Also it helps distinguishing delegates and speakers.

*User Requirement 16. Edit VIP e-ticket* - Edit a VIP e-ticket in the system. The system should allow a manager or administrator to modify the content of a VIP electronic ticket. The content that is modified relies in the database, thus not giving any errors when the QR code is scanned. However content in VIP tickets is handled more securely than Normal tickets.

*User Requirement 17. Delete VIP e-ticket* - Delete an existing VIP e-ticket from the system. The system should give the ability to the administrator and manager, the power to remove a VIP ticket from the VIP ticket list. Thus if the QR code is scanned, it will be invalid and the attendee will be refused entrance. However, a verification email will be sent to the VIP attendee for confirmation.

*User Requirement 18. Confirm e-ticket* - Confirm e-ticket. The system should be able to verify Normal e-ticket by connecting the ticket ID with the event ID and user ID this way it can increase the security check and integrity of the system.

*User Requirement 19. Confirm VIP e-ticket* - Confirm VIP e-ticket. The system should be able to verify a VIP e-ticket by connecting the ticket ID with the event ID and user ID.

*User Requirement 20. New events settings* - Configure the criteria of new events. The systems is required to allow the administrator to configure the events settings from how to they are displayed until the length of the title of one event.

*User Requirement 21. Configure uploads* - Manage images uploaded with events.

The system should allow the administrator to configure what is uploaded unto the server and into the databases.

*User Requirement 22. Add user* - Create a new user. The system is required to be able to add a user with manager or administrator privileges or from the registration form. The administrator may add a user manually with specific reason.

*User Requirement 23. Edit user* - Edit a user's profile. An administrator may modify content of the profile of a manager or user if necessary.

*User Requirement 24. Delete user* - Delete a user from the system. The system should be able to remove a user from the database and off the system if the user requests for deletion of their account or if the account is to be removed because of a violation.

*User Requirement 25. Share event* - Share an event with friends. The system is required to have the ability to enable any user to share an event over a social network via plug-ins.

*User Requirement 26. Recover lost user account* - Recover password or username. The system should be able to recover a user's account or lost password, sending a request to the user databases via JSON and retrieving the data that has been forgotten or lost.

*User Requirement 27. View Users* - See the list of all registered users. The system should allow users to view other users attending an event. If a user chooses in his settings that the user does not wish to be displayed, then other users may not view this specific user.

*User Requirement 28. Print e-Ticket* - Print an overview of the article being read.

The system should be able to print the e-ticket if the user wishes.

*User Requirement 29. Participate in Even* - Follow event until event is finished. The

system is required to allow the user to follow an even until that event is over, then

the participation is removed from the users stats.

*User Requirement 30. Cancel Participation* - Remove the participation status for an

event. The system is required to be able to remove the “following” status in a user’s

profile for a specific event. Information should no longer be displayed to the user.

*User Requirement 31. Display e-ticket* - Show the manager/organizer the e-ticket.

The system requires the user to present the e-ticket to the manager or person of

scanning the ticket.

*User Requirement 32. Scan e-ticket* - Scan the e-ticket to verify clearance. The

system is required that it is able to process an e-ticket automatically in an instance

from the scanning device.

*User Requirement 33. Order e-ticket* - Send notification for e-ticket. Once a use

selects the event he desires to attend, the eTMS system automatically send an email

to the users account for confirmation of the order.

*User Requirement 34. Pay for e-ticket* - Send the amount of credit required for e-

ticket to manager/organizer. The system should be able to process the payment

credit through the system from the user’s bank to the managers/organizers bank

account.

## **3.5 Non-Functional Requirements**

### **3.5.1 Hardware Requirements**

A smartphone with 256mb of ram and 10mbs of memory. A pre-installed camera at least 1.3 megapixel. GPRS/GSM 3G internet cellular connectivity.

### **3.5.2 Software Requirements**

Windows Phone 7.5 Operating system.

### **3.5.3 Performance Requirements**

Access time to profile and events information requested by the user should be no longer than 2.5 seconds.

### **3.5.4 Supportability Requirements**

User should be able to access website and receive ticket from any browser

### **3.5.5 Security Requirements**

Connection between the Jetty Servlet and the website is SSL 128-bit encrypted.

### **3.5.6 Interface Requirements**

Ease of use, simple use of light colours, light thin fonts, smooth transition from page to page.

### **3.5.7 Availability Requirements**

The app should be available to download from the Windows Marketplace and the website should online 24/7 in which the user may access anytime of the during a 24 hour period.

### 3.6 Use case diagrams

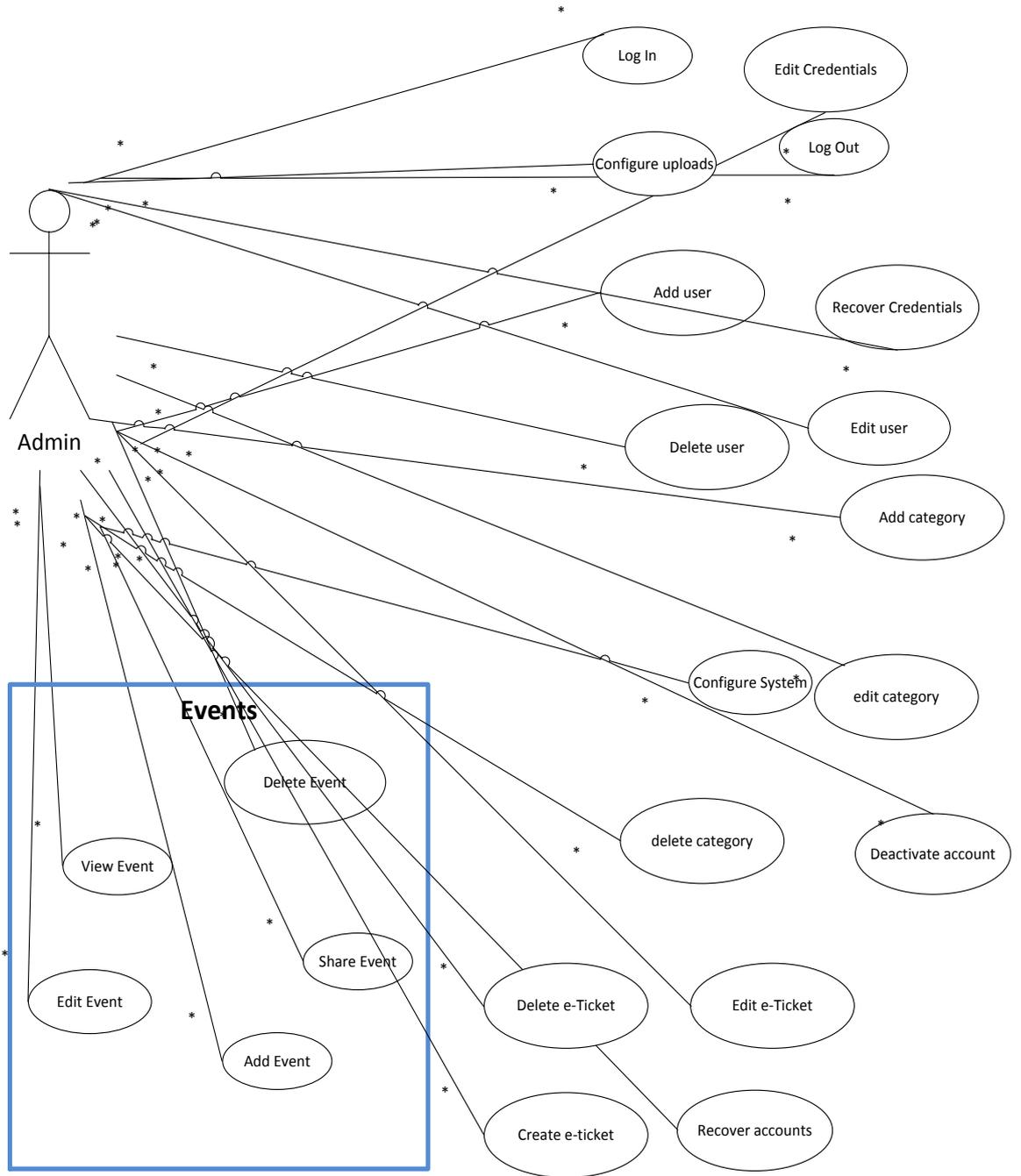
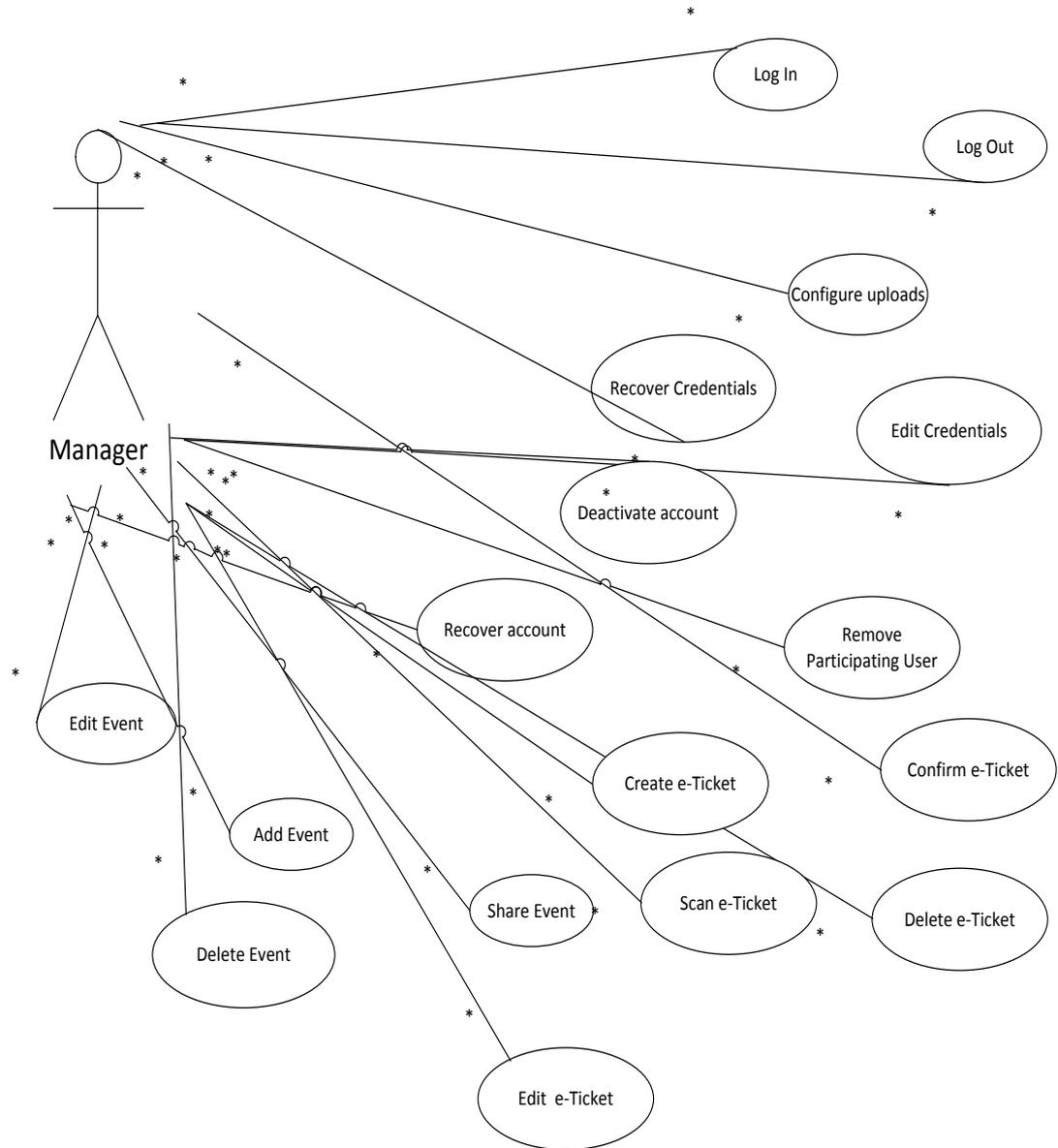


Figure 3.1. Use Case Diagram for Administrator

#### 3.6.1 Administrator [All Rights]:

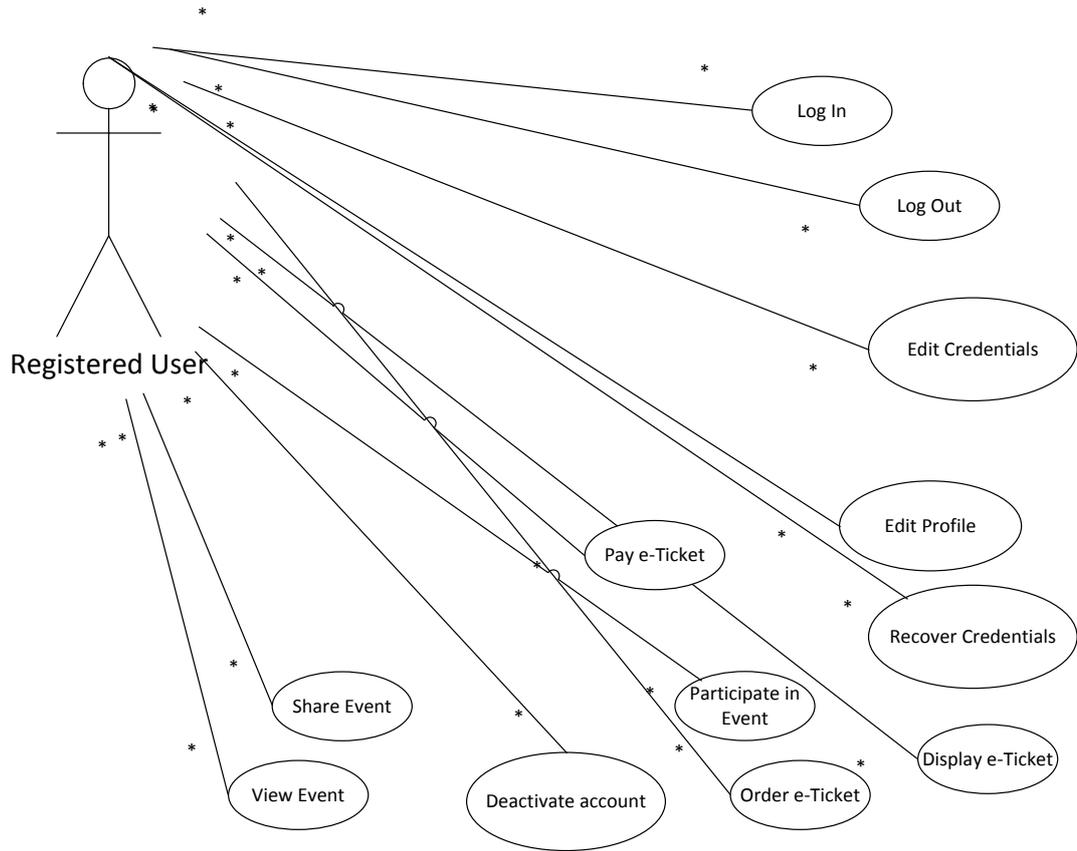
Configure system settings, configure uploads, view/add/edit/erase events, view/add/edit/erase categories, view/add/edit/erase users, edit credentials, recover credentials, deactivate account. The administrator is in charge of all the system configurations and has all the privileges.



**Figure 3.2. Use Case Diagram for Manager**

**3.6.2 Manager [Limited Rights]:**

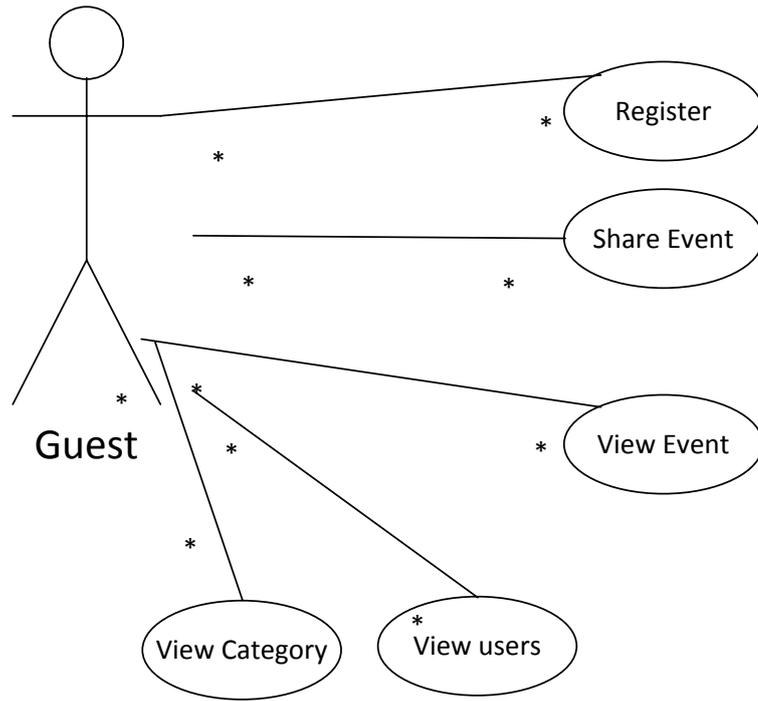
View/add/edit/erase events, View/add/edit/erase tickets, view users, view categories, edit credentials, recover credentials, scan/confirm e-ticket, deactivate account.



**Figure 3.3. Use Case Diagram for Registered User**

**3.6.3 Registered User [Limited Rights]:**

View events, view users, view categories, edit credentials, recover credentials, and deactivate account.

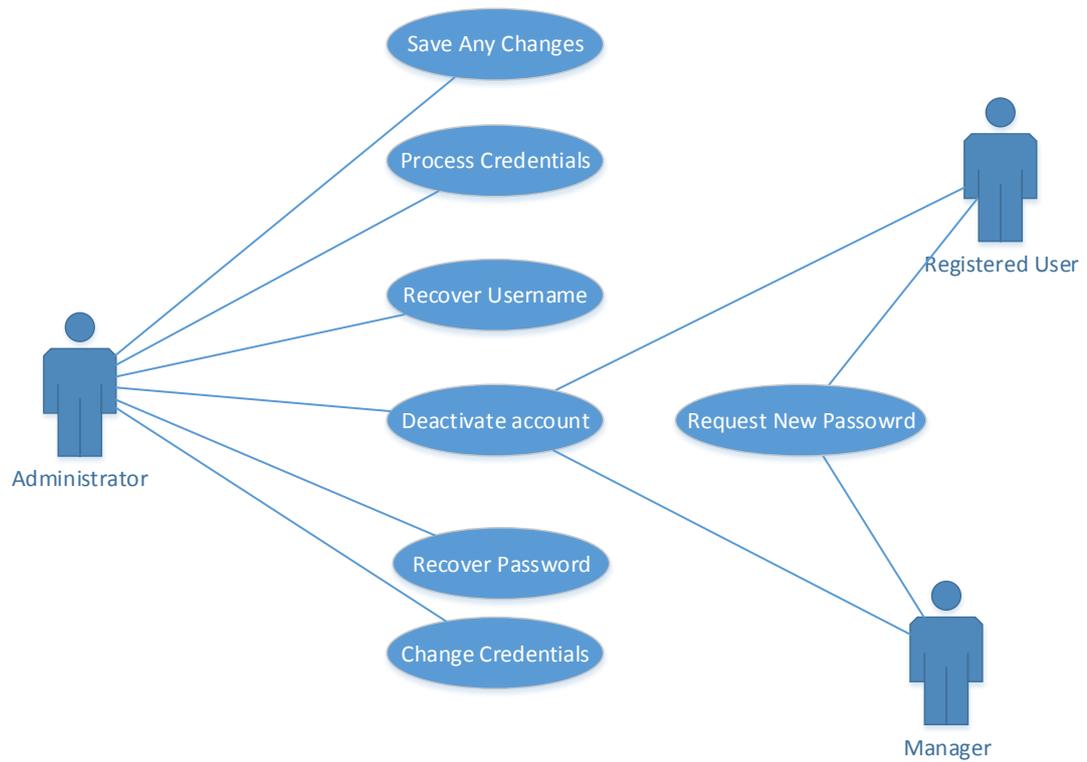


**Figure 3.4. Use Case Diagram for Guest**

### **3.6.4 Guest User [Very Limited Rights]**

View events, view categories, view users, Register.

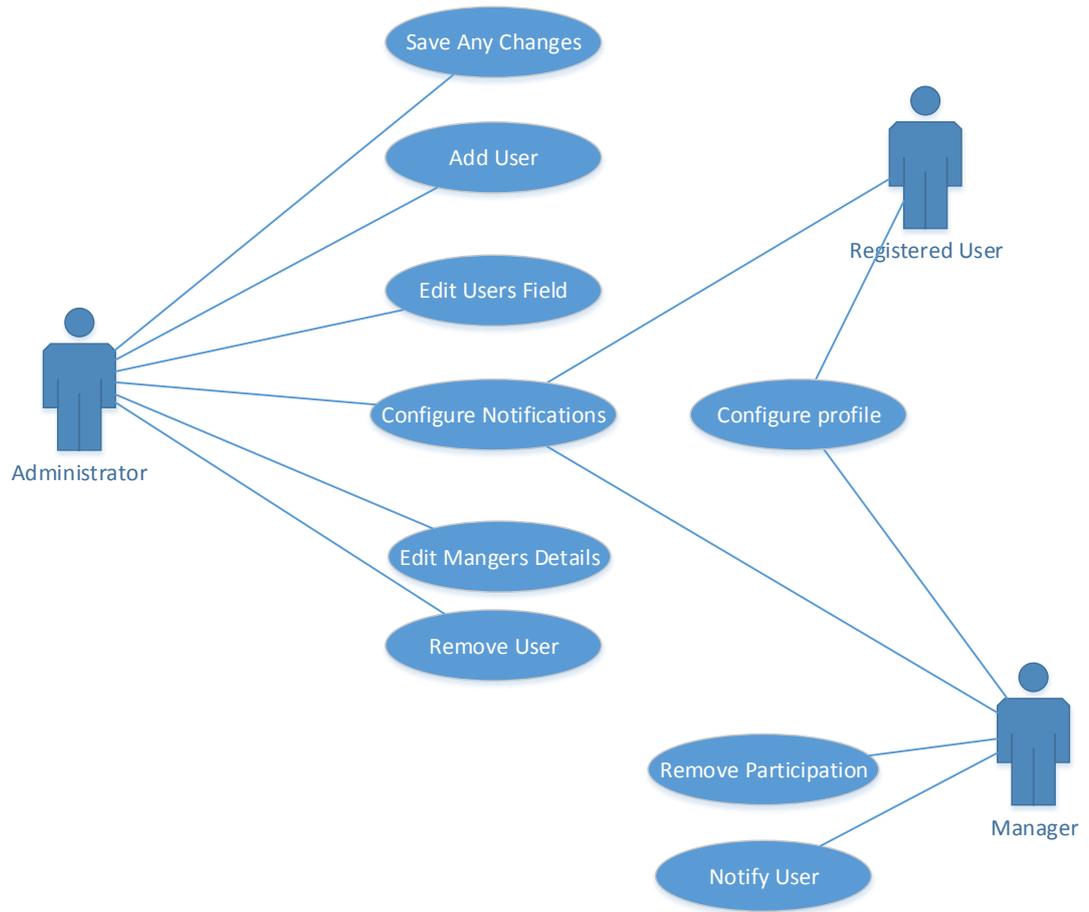
### 3.7 Use Case Description



**Figure 3.5 - Use Case Diagram 1**

#### UC-1: *Recover and Manager Users*

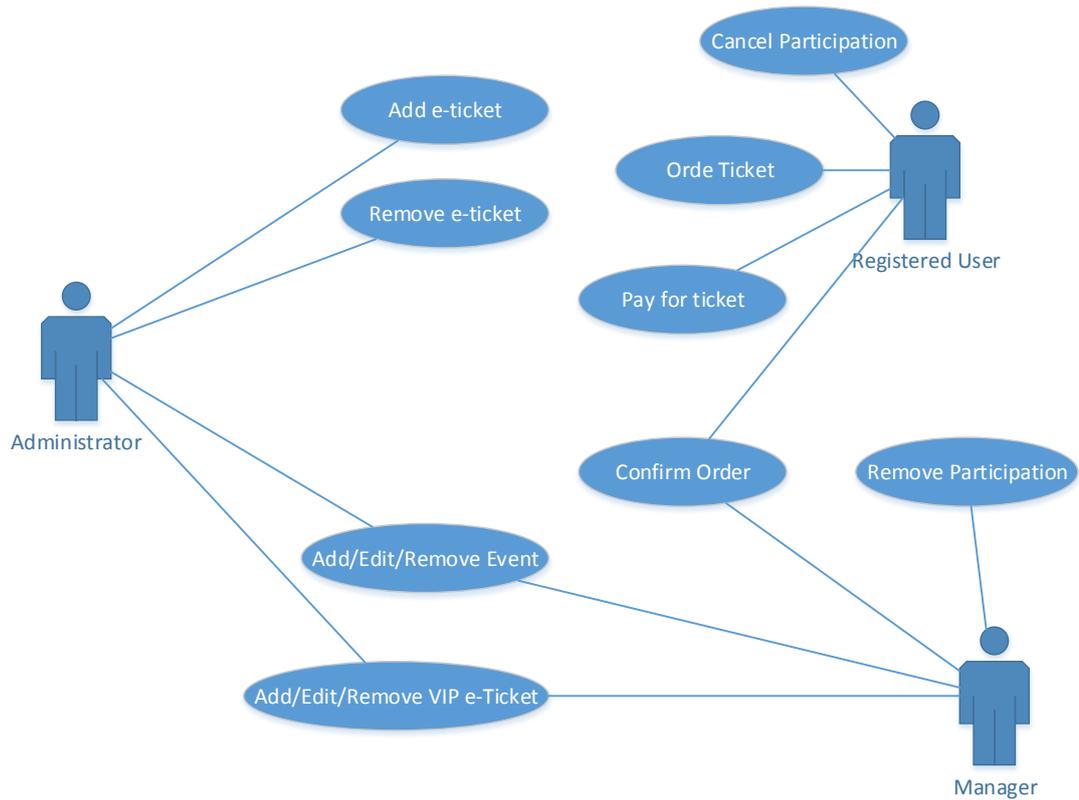
The EMS must be able to manage and recover if necessary, any lost or stolen accounts or credentials belong to a member or user. The system shall query the user on behalf of the account type needed to be recovered. If a user wants their credentials changed, then the administrator will process it through the EMS information's system.



**Figure 3.6 - Use Case Diagram 2**

*UC-2: Update User Content*

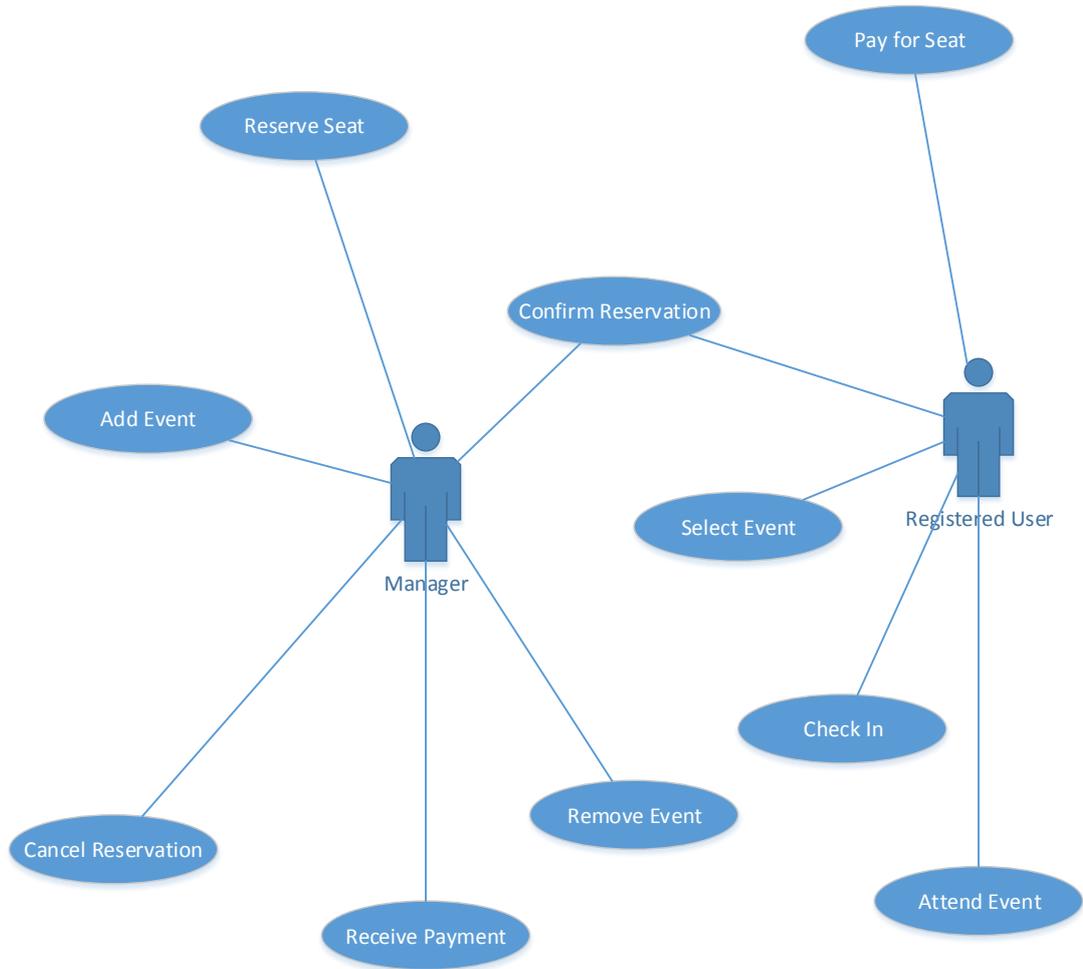
The e-ticketing management system must allow the users (administrators, managers, organizers and end users) to update their own personal profile information and notification settings. Manager may also remove any unwanted attendees.



**Figure 3.7 - Use Case Diagram 3**

*UC-3: e-Ticket Ordering*

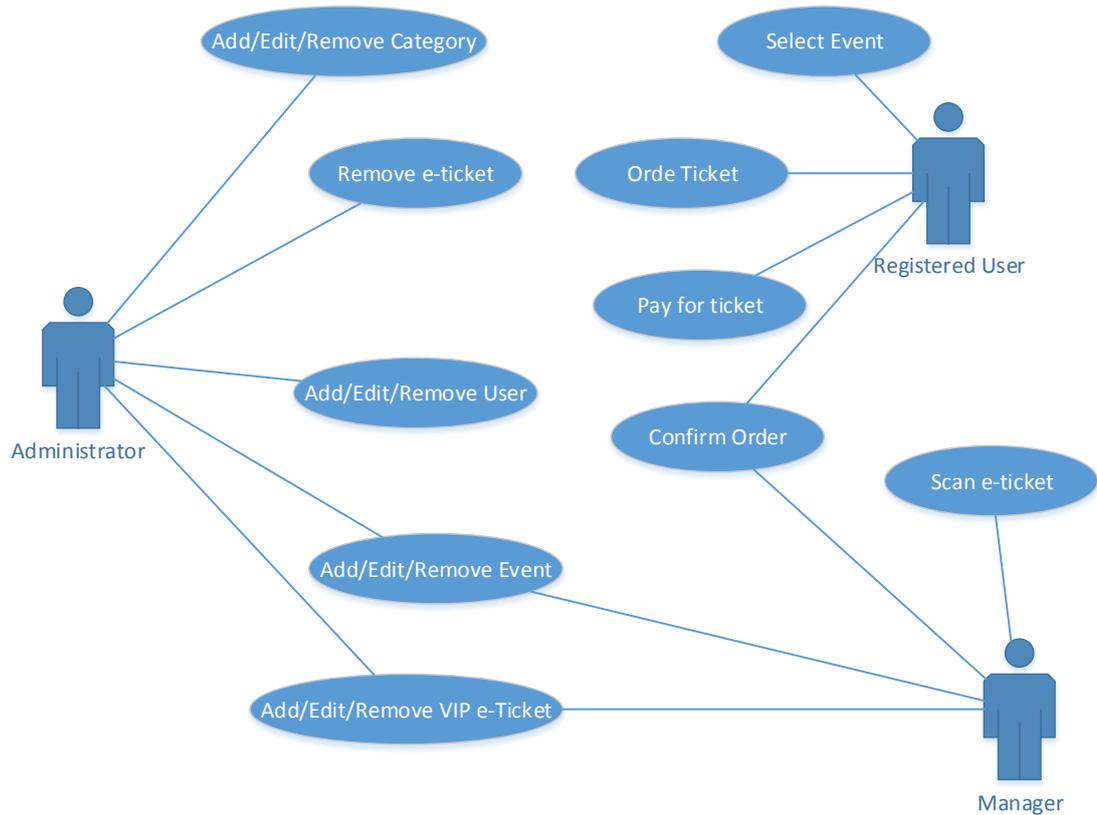
The system must enable the user to view events, the categories of events, the ability to order a ticket for the event specified electronically. Once a user has ordered the ticket, it must then be sent to the user electronically where the user will download or receive digitally. The system shall query the user for the amount of money needed to pay for the ticket. The user will download an event ticket and display it to the event manager/organizer. If the information on the QR e-ticket is true and it corresponds with the information in the database, then the user may enter, if the information is false, the user will be refused entrance and asked to leave.



**Figure 3.8 - Use Case Diagram 4**

*UC-4: Making reservations*

The purpose of e-tickets is to have the ability to pay, receive the ticket electronically, also pay electronically, however the requirement is also to be able to make reservations. Just as the user may order, pay and receive the e-ticket, they can also make reservations online, so when arriving at the event, seating will not be an issue.

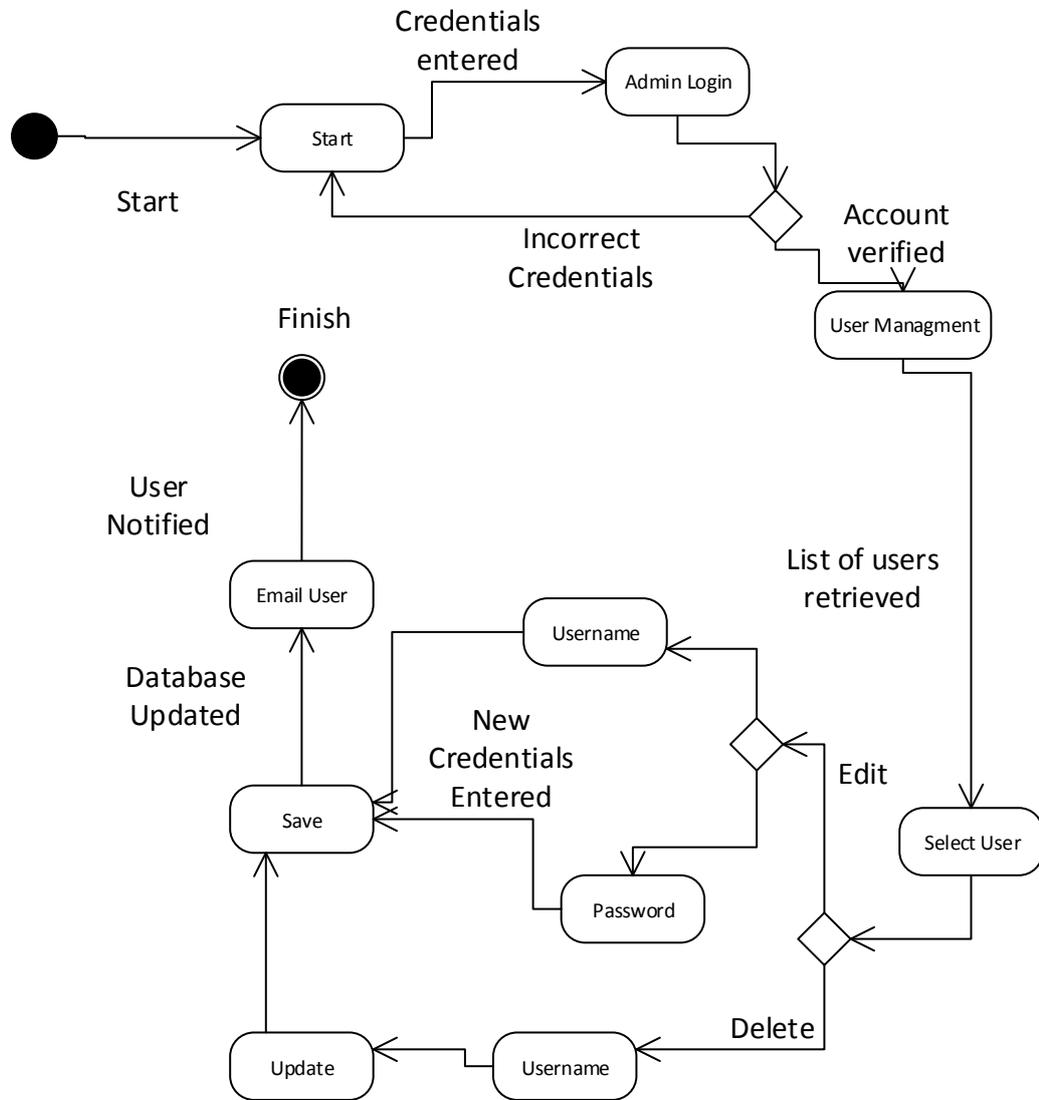


**Figure 3.9 - Use Case Diagram 5**

*UC-5: Managing Events and Tickets*

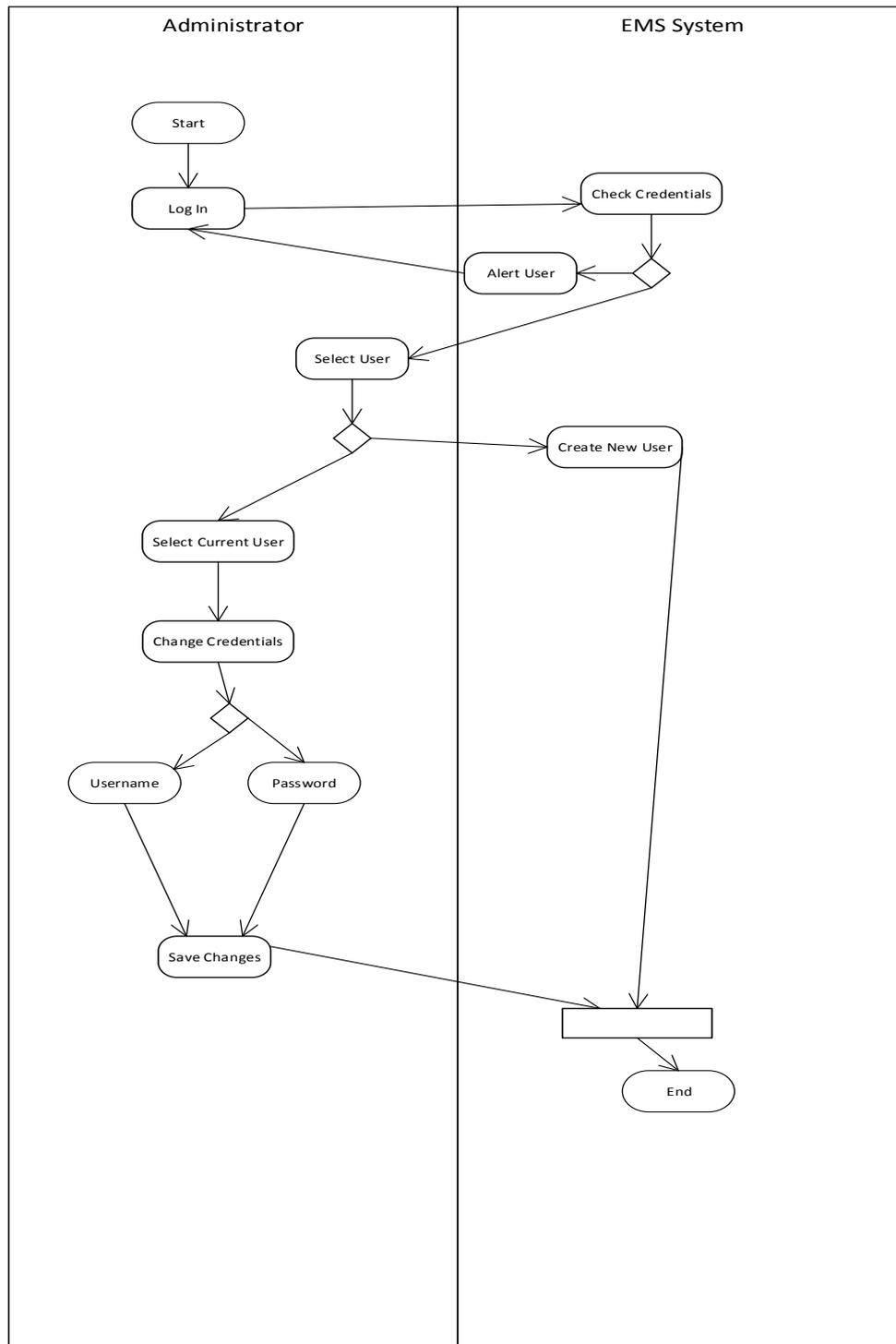
The EMS is required to create, and manage the electronic tickets provided to the users. The system should also be able to produce two kinds of e-tickets: a VIP ticket which grants special access to an event and a normal ticket with default privileges. When a ticket is ordered, the credit needed to buy this ticket is received via online payment thus triggering an event that creates tickets in the database. One ticket is sent to the user via email and the other is sent to a back-up safe private database for categorisation purposes. Once the ticket is received by the user, then the user shall present the ticket to the scanner and the ticket shall automatically become invalid. The system should be able to view, create, edit and delete an event for the administrator or the manager of a location [venue]. Events should be categorised according to the category defaults. The system should be able to let the administrator manager the categories and terminate if necessary an event from a category.

### 3.8 Behavioural Diagrams



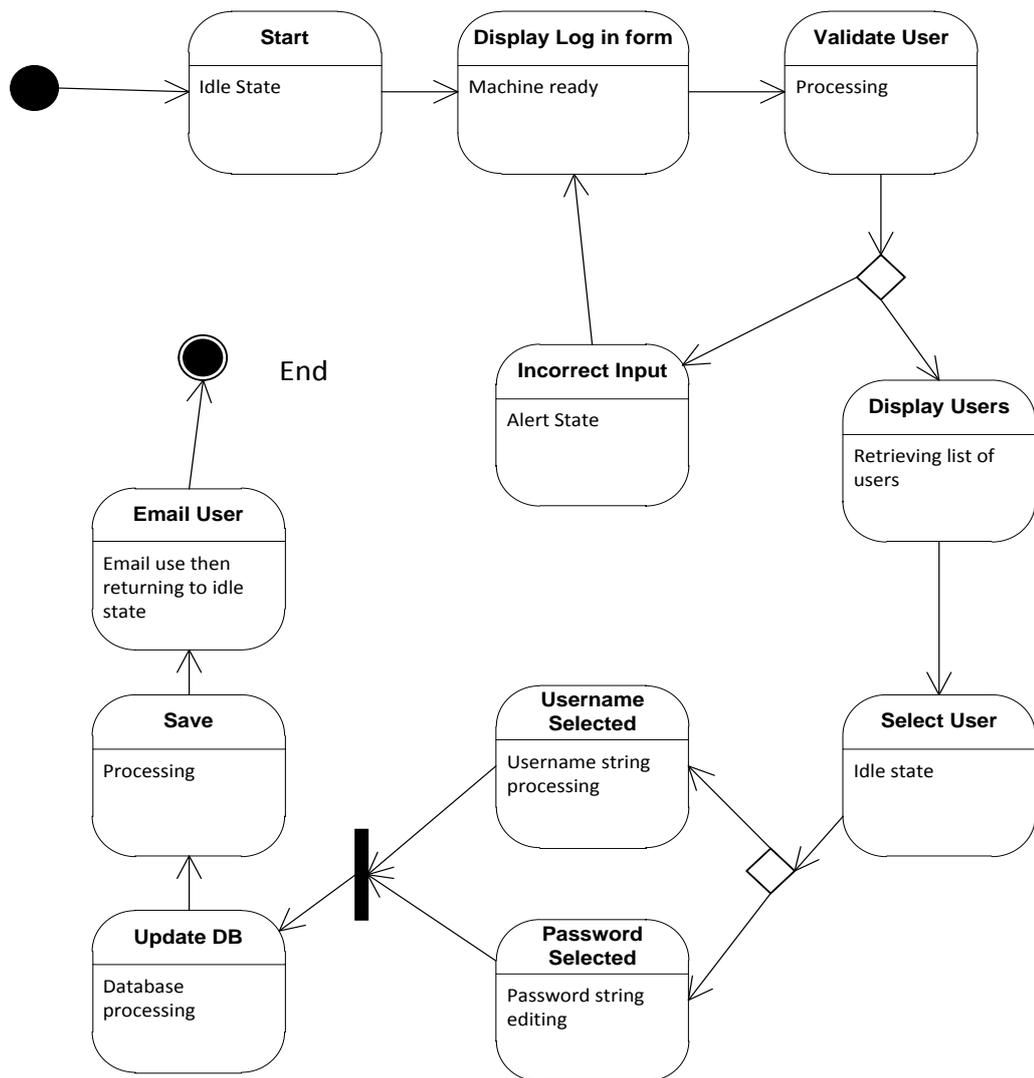
**Figure 3.10. Activity Diagram for Main Use Case 1**

I achieved by the activity diagram by following the steps need to be taken for the recovering of user credentials diagram. Without the admin logging, no further steps may be taken for the user to recover their account.



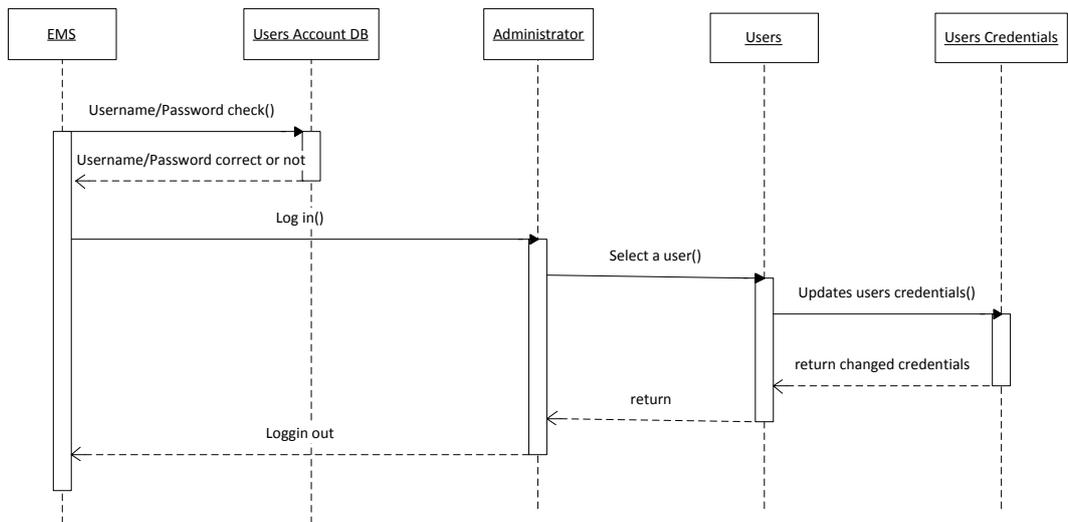
**Figure 3.11. Swim lane Diagram for Main Use Case 1**

Here I have shown the steps required by the Admin to take after the system is done with its own steps. Some steps are taken by the eTMS system itself. The swim lane diagram helps us divide the actor's responsibilities.



**Figure 3.12. State Machine Diagram for Main User Case 1**

This diagram show the states of the machine once the admin logs in and starts to use the eTMS. The machine is in different states each time an action is performed or succeeded.



**Figure 3.13. Sequence Diagram for Main Use Case 1**

Here is the sequence diagram that shows the processes operate with each other and the time frame which displays them in a sequential order.



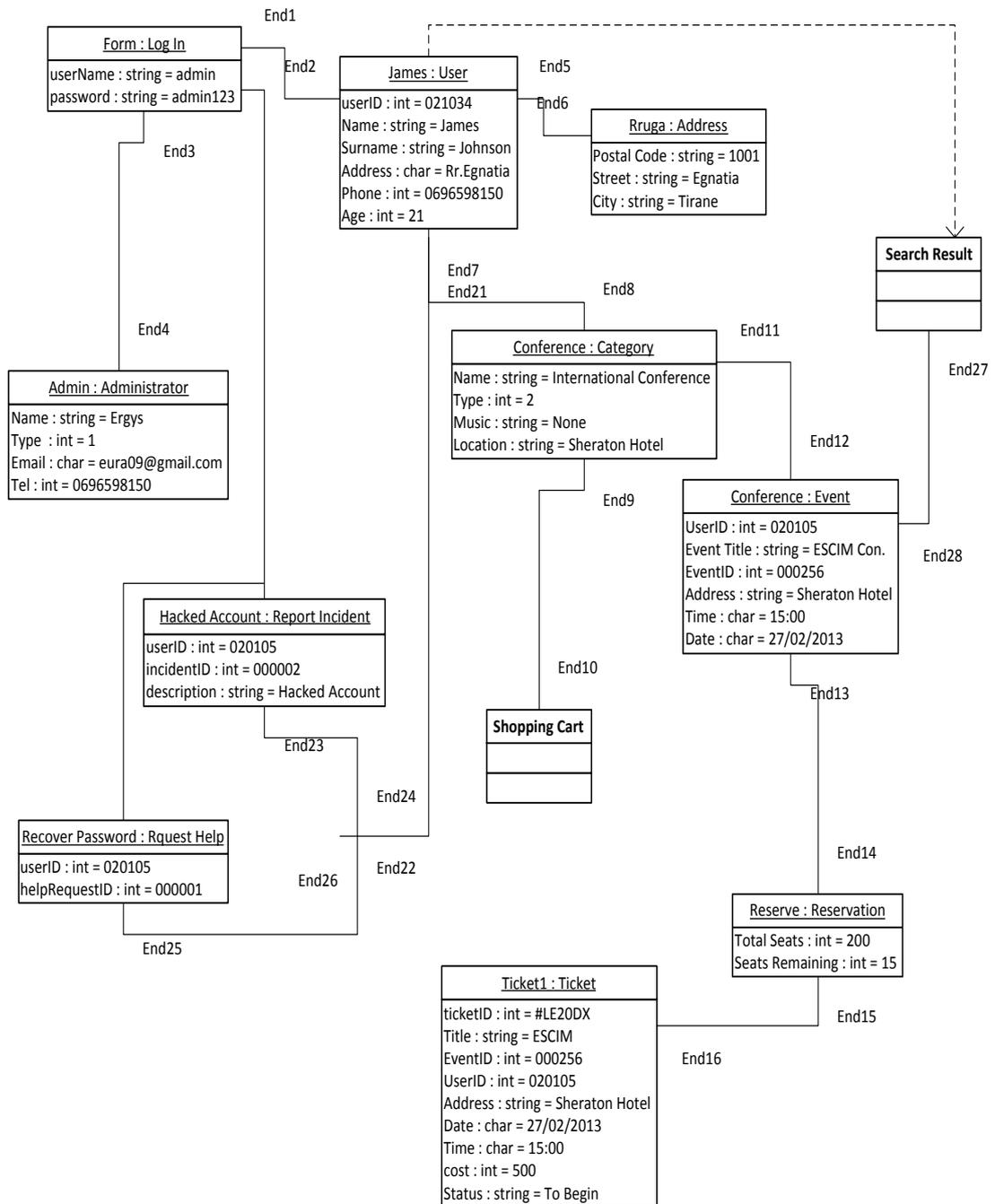
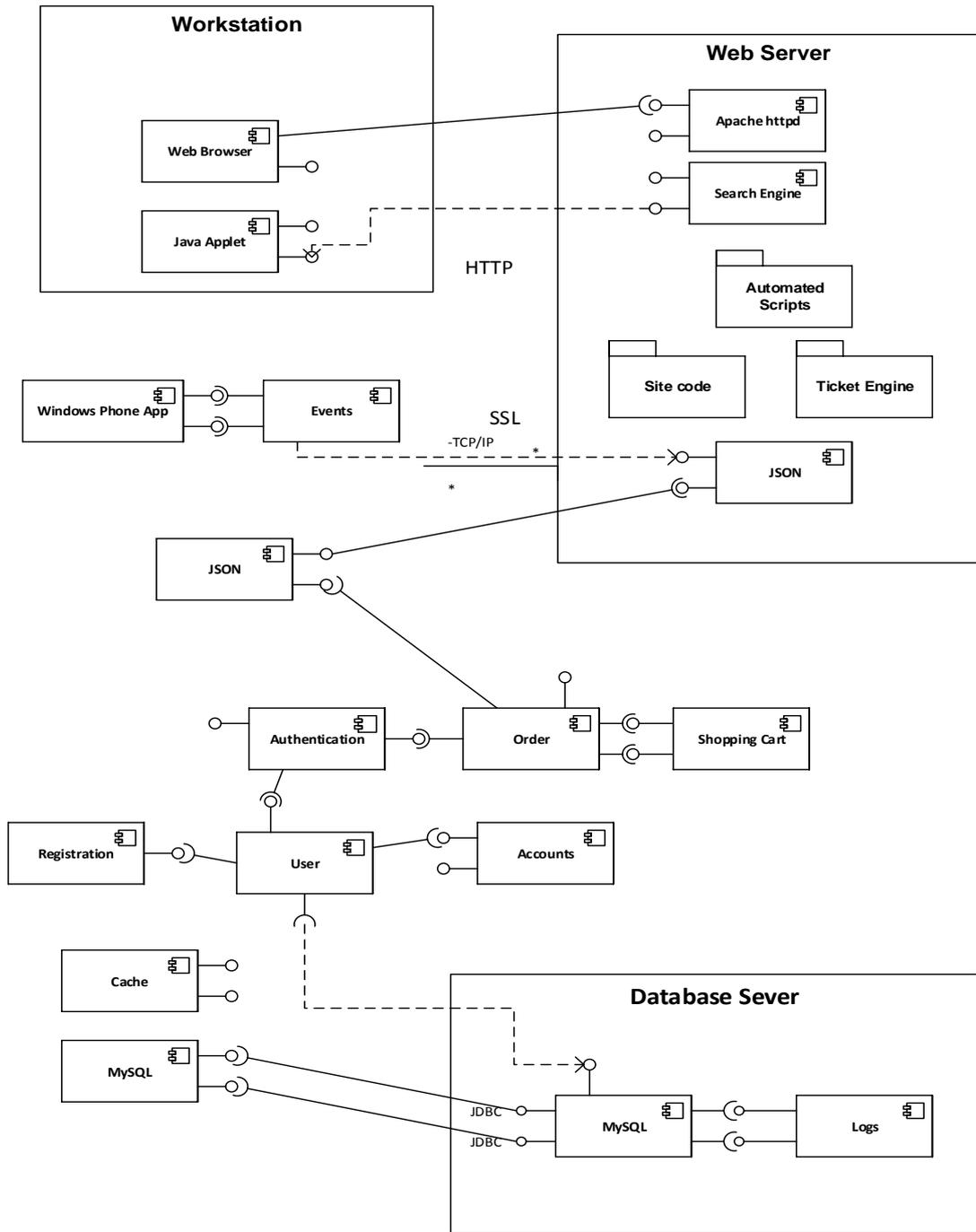


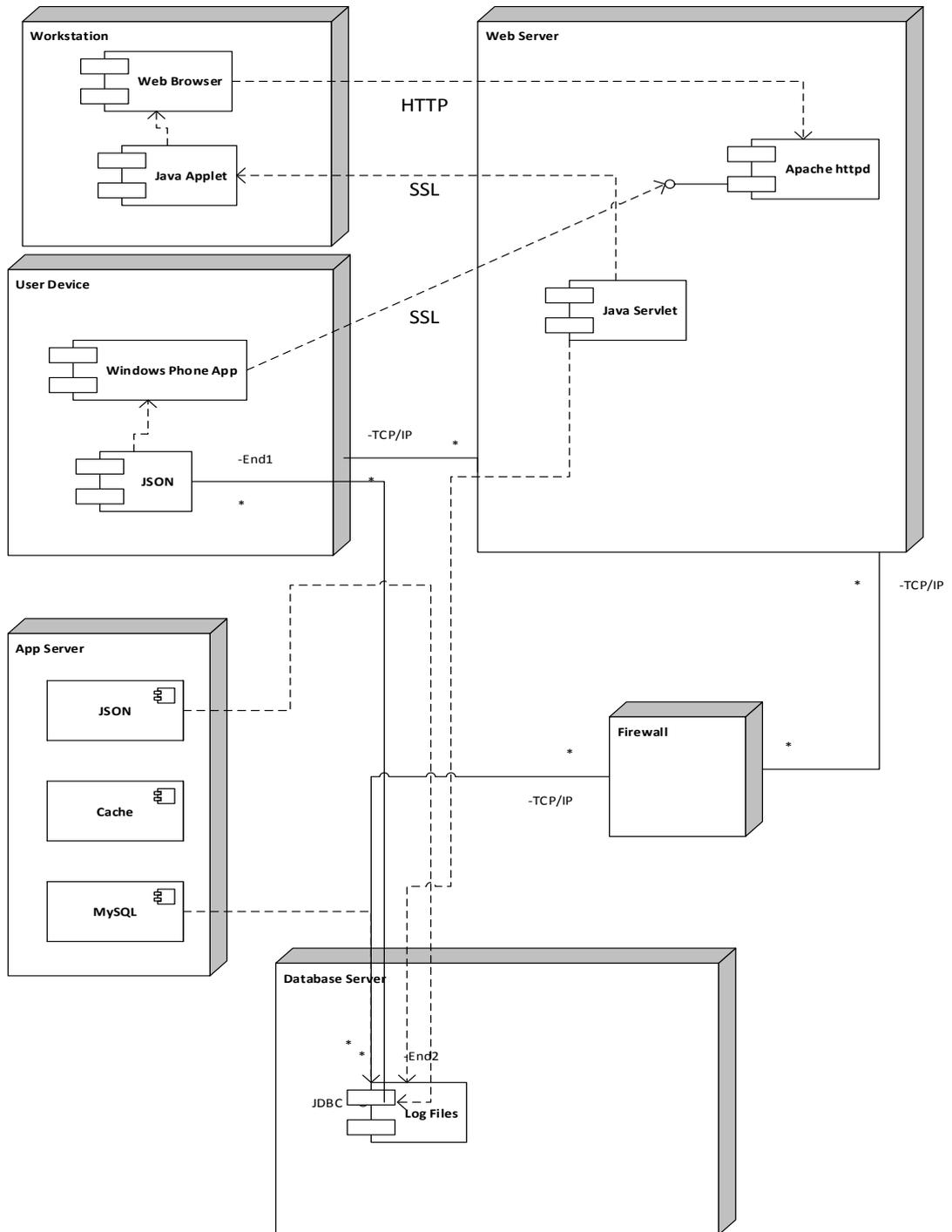
Figure 3.15. Object Diagram - General Overview

This diagram shows the same overview as the class diagram but at specific time or an instance. The objects are filled with dummy variables to show a demo how all the classes and objects are connected.



**Figure 3.16. Component Diagram - General Overview**

This diagram shows how the software and hardware components inside the database server, web server, client's workstation, mobile device and the app server are connected and working with each other.



**Figure 3.17. Deployment Diagram - General Overview**

This diagram shows the physical architecture of the e-ticketing management system. It is the result of connecting all physical nodes of the system together.

## **Chapter 4 Implementation**

### **4.1 Technology Used**

What is being created is a new system that help users and managers control events and event details. It helps manage events electronically.

The application will run on Windows Phone 7.5 operating system. The code will be written in C# using Silverlight for Windows Phone and .NET Framework 4.0. It will basically be a management system for organizers and coordinators. There will a database to keep all registered users and to give the signing in and out feature. The manager will have the rights to create, edit and delete an event.

When an event is created, automatically a space is set ready for participants. The same effect will happen when a user registers for an event; an e-ticket is automatically set ready to be created for that user related to the event they have signed up for.

With this application, managers will able to manage events, participants and e-tickets directly from their mobile without any extra work. The registration and payment for a reservation or ticket will be made online via debit cards or PayPal.

### **4.2 System Requirements**

E-Ticketing Management System will be an online and offline management system.

The requirements needed are:

#### **4.2.1 A Server and a Host**

A server is needed to host the databases containing the manager, administrator, events and tickets data. The data stored contains information related to a registered account which can be an organizer or a manager.

#### **4.2.2 Domain**

The domain is required to host the website where users may find events and tickets.

#### **4.2.3 HTML5**

The latest version of the HTML which also includes XHTML markup language will be used to structure and present the content to the user.

#### **4.2.4 CSS3**

Another Beta release of the CSS is in progress and this will be used to cover and present the semantics of the website or app.

#### **4.2.5 .Net Framework 4.0**

Microsoft's own development framework that contains many libraries and also it will aid in C# programming which is provided by the CLR environment from the Silverlight API.

#### **4.2.6 .PHP**

This is the server-side scripting language that will be used to make the website dynamic and functional while being able to produce dynamic web pages itself. This is also open source.

#### **4.2.7 MySQL + JSON**

The relational database management system that is open sourced and that works with large chunks of data. It is also one of the RDMS that will allow data to be transmitted between Windows Phone devices and classic databases without much problem. JSON will be used to retrieve the data.s

#### **4.2.8 C#**

The language behind the .Net Framework which builds the mobile application upon the Silverlight plug-in.

#### **4.2.9 Silverlight for Windows Phone**

The tool developed by Microsoft to be able to develop internet and mobile applications for the Microsoft software environment.

### **4.3 Software**

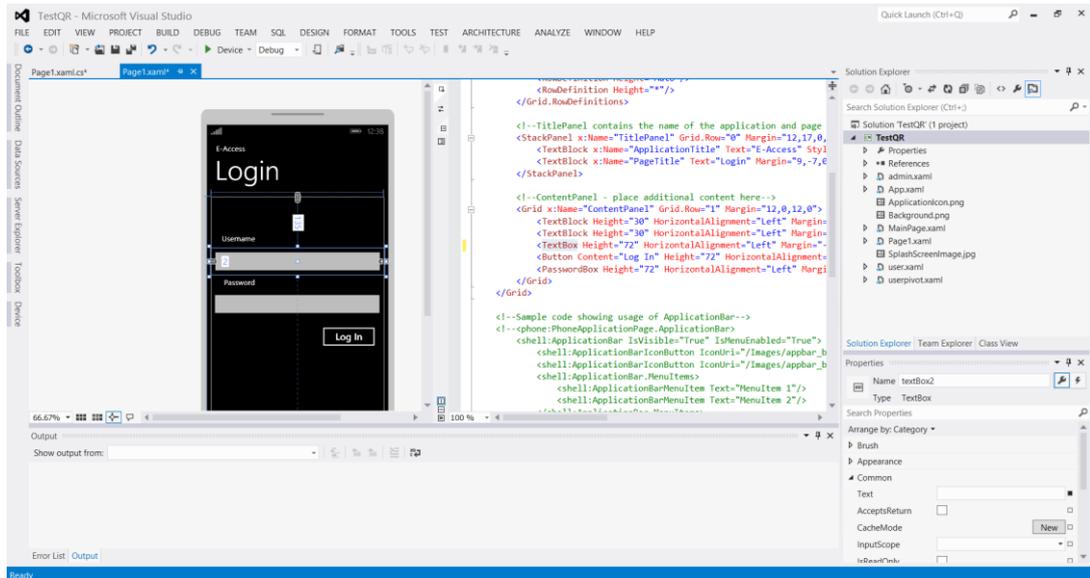
For the implementation of the project, I used the following software:

1. *Microsoft Visual Studio 2012 Ultimate* – This programming platform enabled me to program and manipulates the features provided by the dot.Net framework, thus achieving my goal of building a windows phone 7 app.
2. *Adobe Dreamweaver CS6* – This piece of software allowed me to develop the website of the project, allowing me to create and edit code in html5, css3, php5 and JavaScript.
3. *Xampp* – After having the software to be able to program the mobile and website part of the project, I needed software that could easily handle databases and that's where xampp comes in with its features such as Phpmyadmin, allowing me to create, edit and delete databases at my will.

4. *Adobe Photoshop CS6 Extended* – For the design and images included in the project, I was aided by Photoshop, a common program that allows many such as me to edit and create images that can brighten up the look and feel of the application alongside the website.

#### **4.4 The Mobile App**

After designing the architecture and design of how the application will run and look, I started with the mobile coding first. Before even beginning the programming, I downloaded a library that would enable me to utilize the camera feature of the phone. The library is called ZXing.Net and is in development stages, yet it can still perform the main functions. This library will help me decode and generate codes such as QR Code, PDF 417, EAN, UPC, Aztec, Data Matrix, Codabar.



**Figure 18 – Screenshot of Visual Studio 2012**

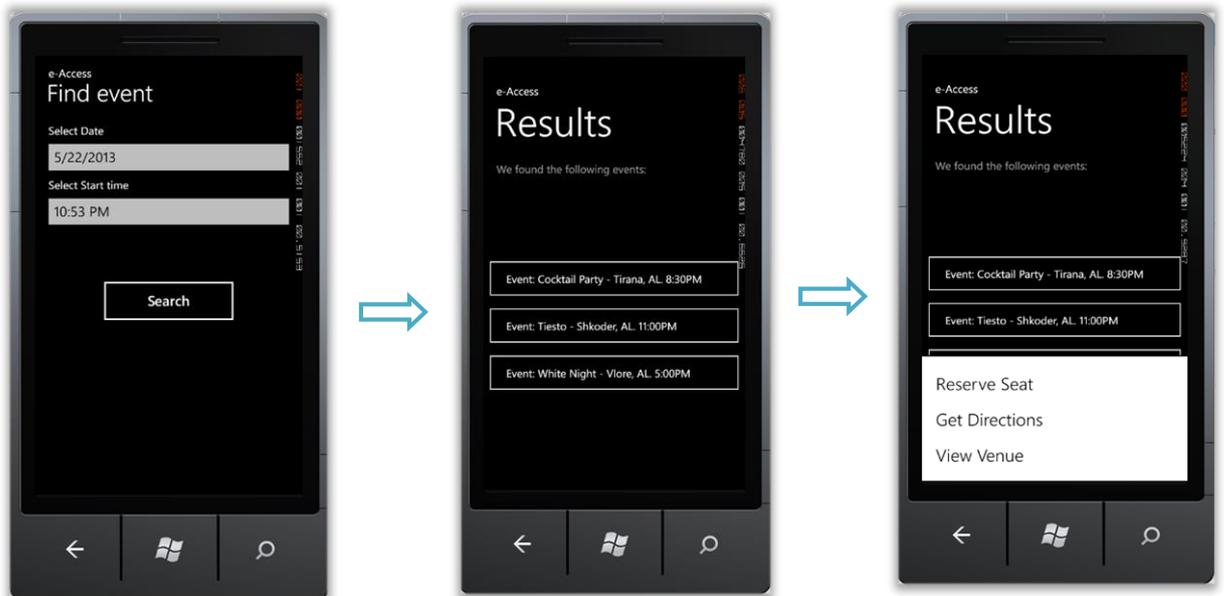
The platform I am programming on is called Microsoft Visual Studio 2012 Ultimate and its rich features such as the Silverlight programming and virtual machine deployment. I first began creating the welcome screen which in turn is also the log in screen. In windows phone, pages are known as “.xaml”, Whenever a user enters the application on mobile, they are presented with the Log in screen.



**Figure 19 - Screenshot of Login page**

Having just a log in screen is not enough thus I created the following pages in accordance with the architecture design:

1. Home screen (log in)
2. Profile (User/Manager)
3. Tickets
4. Scan screen
5. About (Info)
6. Settings



**Figure 20 - Steps in searching for event**

In order for the QR code scanner to work, I had to import the ZXing library. Which then I was able to get the scanner working, however in a virtual environment the camera function is disabled so I had to do all tests relating to the camera on my very own device. One unique feature the windows phone has is called the panoramic menu. There is also the Pivot menu but that is slightly different to the current method I am implementing into the app.

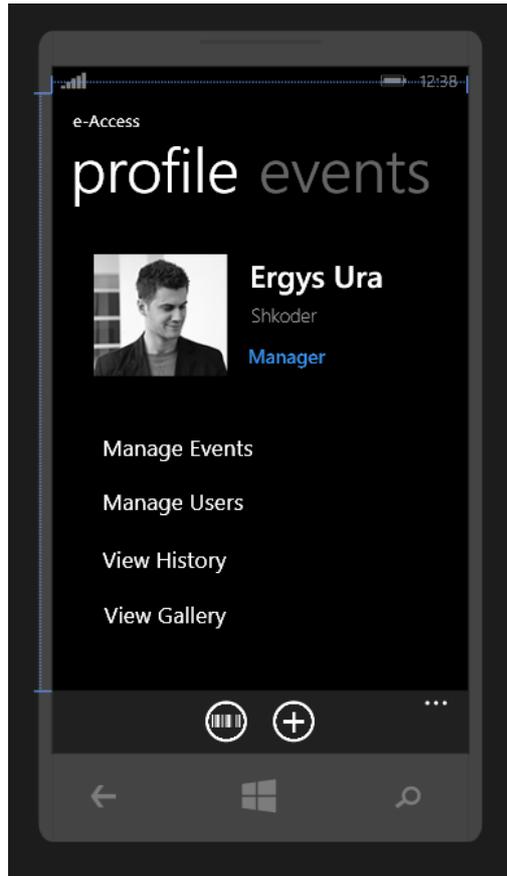


Figure 21 - Panorama example

In C#, it can be translated as such:

```
<!--LayoutRoot is the root grid where all page content is placed-->
<Grid x:Name="LayoutRoot" Background="Transparent">
  <!--Pivot Control-->
  <controls:Pivot Title="e-Access">
    <!--Pivot item one-->
    <controls:PivotItem Header="profile">
      <Grid>

        <Image x:Name="image" Source="/images/profile.png" HorizontalAlignment="Left"
        <TextBlock HorizontalAlignment="Left" Margin="216,26,0,0" TextWrapping="Wrap"
        <TextBlock HorizontalAlignment="Left" Margin="218,82,0,0" TextWrapping="Wrap"
        <TextBlock HorizontalAlignment="Left" Margin="214,130,0,0" TextWrapping="Wrap"
        <TextBlock HorizontalAlignment="Left" Margin="46,234,0,0" TextWrapping="Wrap"
        <TextBlock HorizontalAlignment="Left" Margin="46,296,0,0" TextWrapping="Wrap"
        <TextBlock HorizontalAlignment="Left" Margin="46,364,0,0" TextWrapping="Wrap"
        <TextBlock HorizontalAlignment="Left" Margin="48,428,0,0" TextWrapping="Wrap"

      </Grid>
    </controls:PivotItem>
  </controls:Pivot>
</Grid>
```

Figure 22 - Coding of the Panorama effect

The final stages of the app are not yet complete as the databases have to be created, setup and then connected to the windows phone local database. However more features are being implemented such as Settings configured by the user. A screenshot of the example can be seen in the figure below.

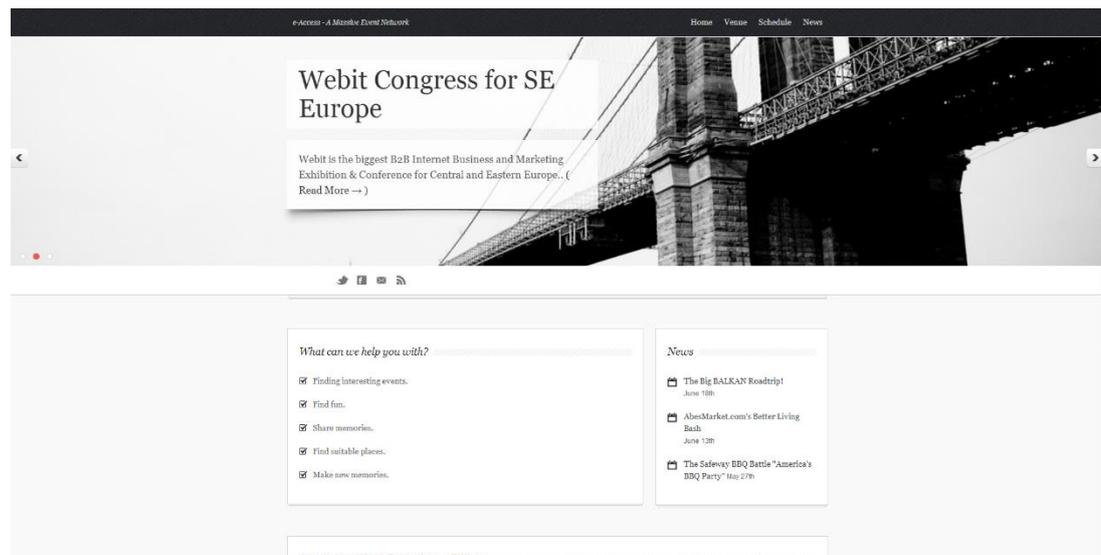


**Figure 23 - Settings page in mobile app**

## 4.5 The website

Now I will discuss the steps of creating the website which will display the events and send the e-tickets to the users thus giving them access to certain events. The list of the web pages is as follow:

1. The welcome page
2. User profile
3. Events page
4. About us



The welcome page will consist of the log in form and the link to allow a new user to register if they need access to the events provided by the platform.

The website is programmed in html5 and css3, with aid from JavaScript for effects and php alongside mysql for the dynamic functions.

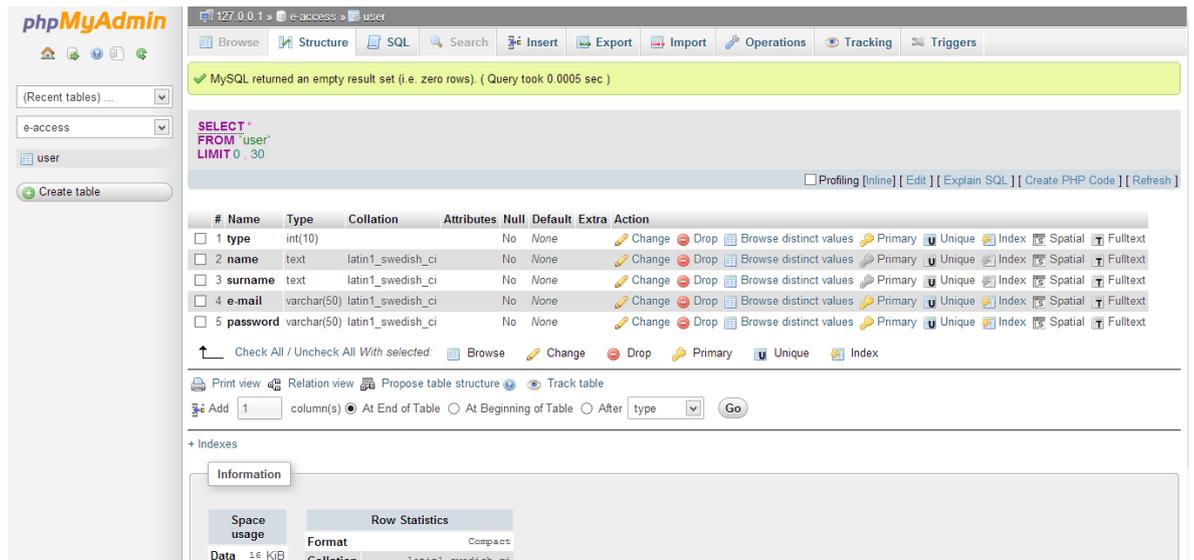


Figure 24 - Database of the data transferred

#### 4.5.1 Code enabling the connection between the database and the website

```
<?php
$user="username";
$password="password";
$databse="e-access";
mysql_connect(localhost,$user,$password);
@mysql_select_db($databse) or die( "Unable to select database");
$query="CREATE TABLE tablename(id int(6) NOT NULL auto_increment,first
varchar(15) NOT NULL,last varchar(15) NOT NULL,field1-name varchar(20)
NOT NULL,field2-name varchar(20) NOT NULL,field3-name varchar(20) NOT
NULL,field4-name varchar(30) NOT NULL,field5-name varchar(30) NOT
NULL,PRIMARY KEY (id),UNIQUE id (id),KEY id_2 (id))";
mysql_query($query);
mysql_close();
?>
```

## 4.5.2 Code enabling the connection between the database and the windows phone

```
// Specify the local database connection string.
string DBConnectionString = "Data Source=isostore:/myEvents.sdf";

// Create the database if it does not exist.
using (ToDoDataContext db = new ToDoDataContext(DBConnectionString))

{
    if (db.DatabaseExists() == false)
    {
        // Create the local database.
        db.CreateDatabase();

        // Prepopulate the categories.
        db.Categories.InsertOnSubmit(new userCategory { Name = "User
" });
        db.Categories.InsertOnSubmit(new userCategory { Name = "Mana
ger" });
        db.Categories.InsertOnSubmit(new ticketCategory { Name = "De
fault" });
        db.Categories.InsertOnSubmit(new ticketCategory { Name = "VI
P" });

        // Save categories to the database.
        db.SubmitChanges();
    }
}
```

### 4.5.3 Microsoft Project Scheduling

To keep everything in track, I used Microsoft Project Professional 2013, it helped keep the programming running and the work scheduled.

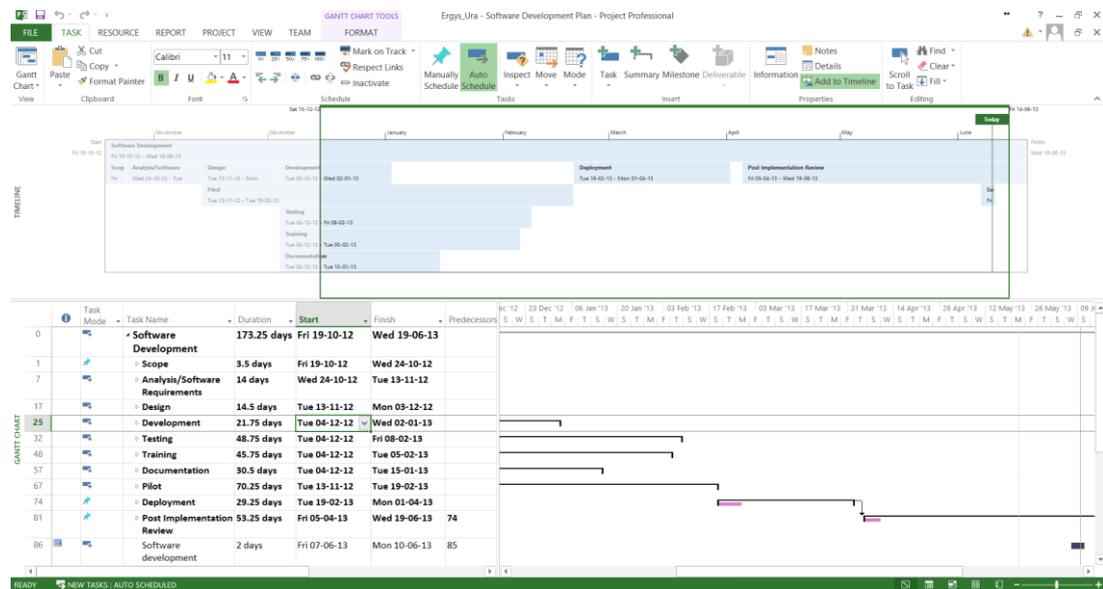


Figure 25 - MS Project screenshot

## **Chapter 5 Conclusion**

### **5.1 Conclusion**

To sum up the work, the QR code application will work as intended and provide the features and requirements it intends to have. The technology of QR code as discussed can be used for many purposes but the best use so far has been the use of advertisement and marketing. As a result we have seen a number of reasons why QR code technology is and can be the future in specific areas. NFC is a strong competitor with contactless payment however it lacks power in the advertising campaign and technology diffusion. The QR code technology has set a new limit for barcodes and will continue to do so for some time. We saw as an example of the implementation of the QR code and an information's system built for managing event tickets. With aim of removing traditional tickets, the Tickets Management System will reduce and save cost for many business as today's economy is not as stable as it used to be, especially in a developing country such as Albania. The need for cost-effective and real-time solutions is in high demand and the TMS provides just that. During my research I have discovered that technology advances, and as it advances it helps people connect. It helps people connect to services, events and other people bringing about security and the notion of being close. One of those technologies is QR code technology.

## **5.2 Suggestions for further research**

The technology of Quick Response is a form of communication and contactless transmission of data. During this these I have explained and talk about a management system that is cost-effective and eco-friendly. But the field Quick Response codes has only just come out of its cocoon and so much more can be done with this technology. The next step would to utilize QR technology with different kind of technology and explore the vast usage in the Asian continent vs. the West. It has been proven that different mind sets exist of how Asians and Americans see the outcome of QR code technology.

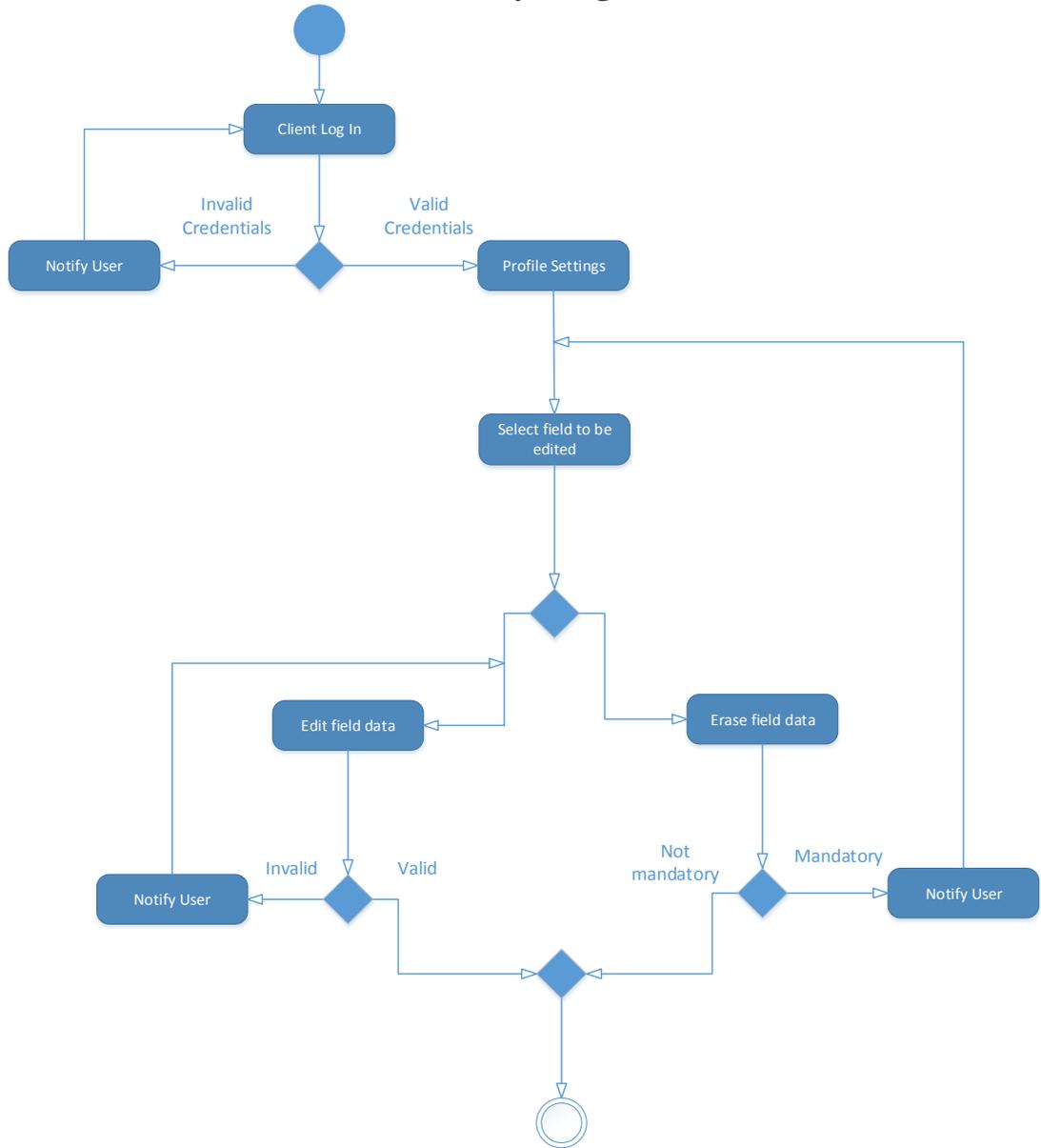
## **Chapter 6**

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## Appendix A A1. Activity Diagrams



**Figure 0.1 - Activity Diagram for Updating User Content**

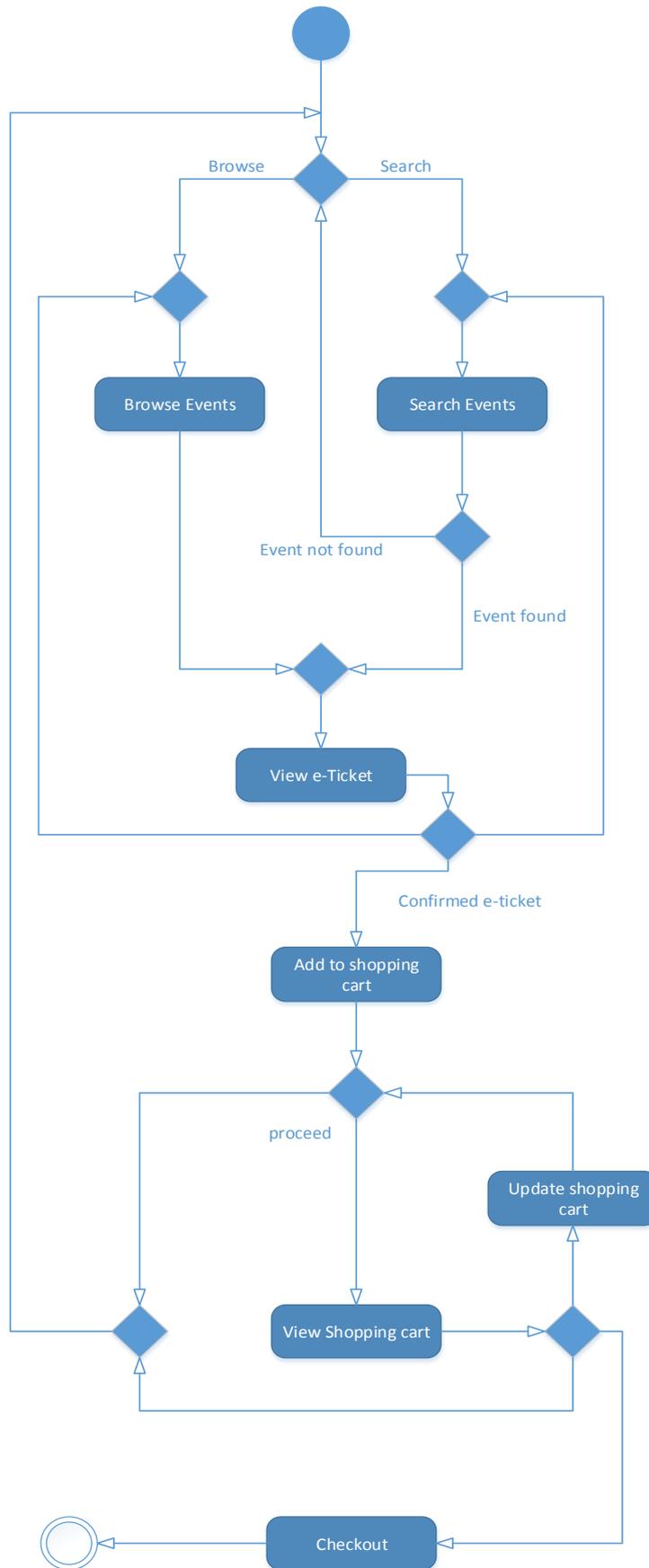
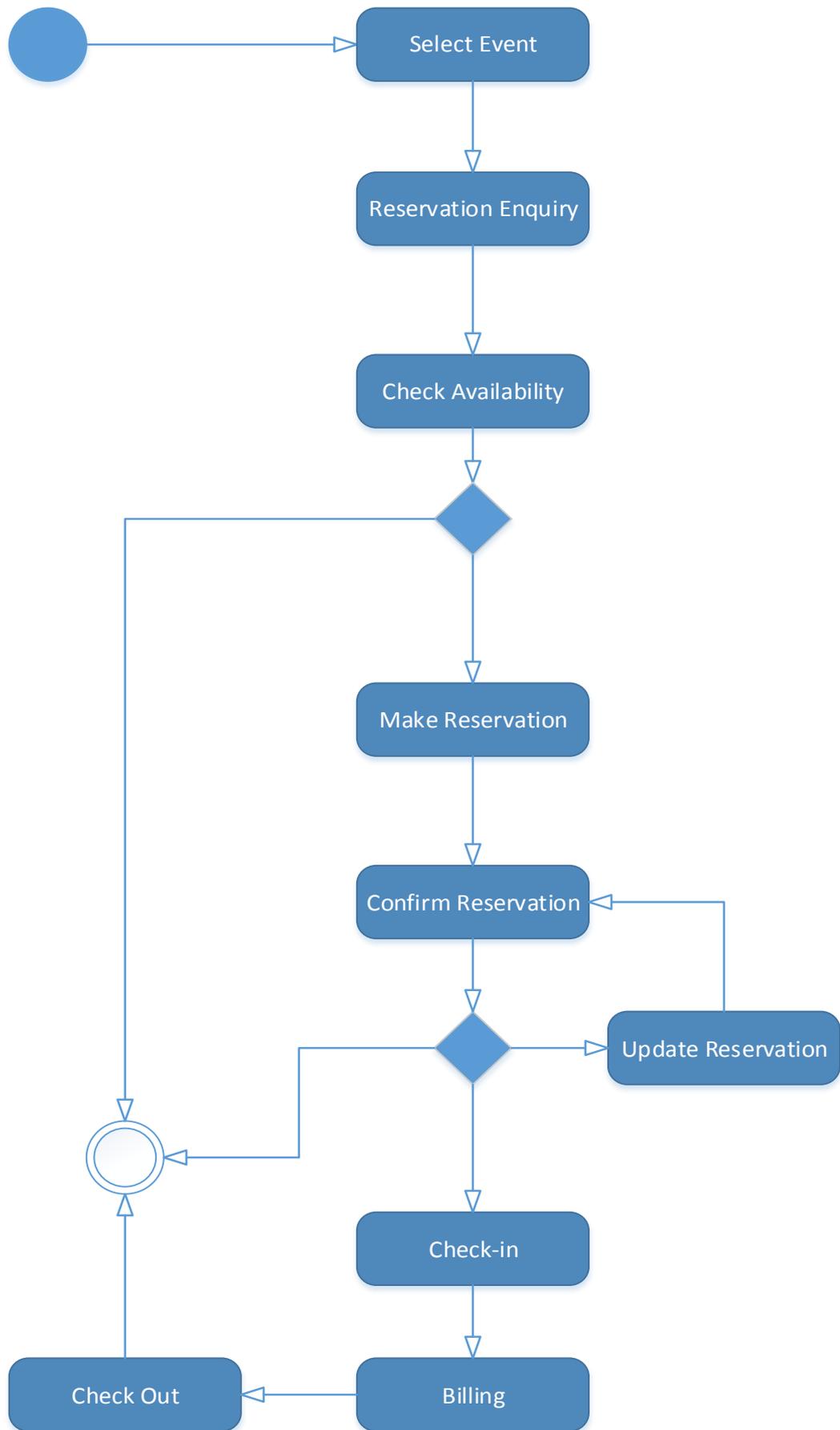
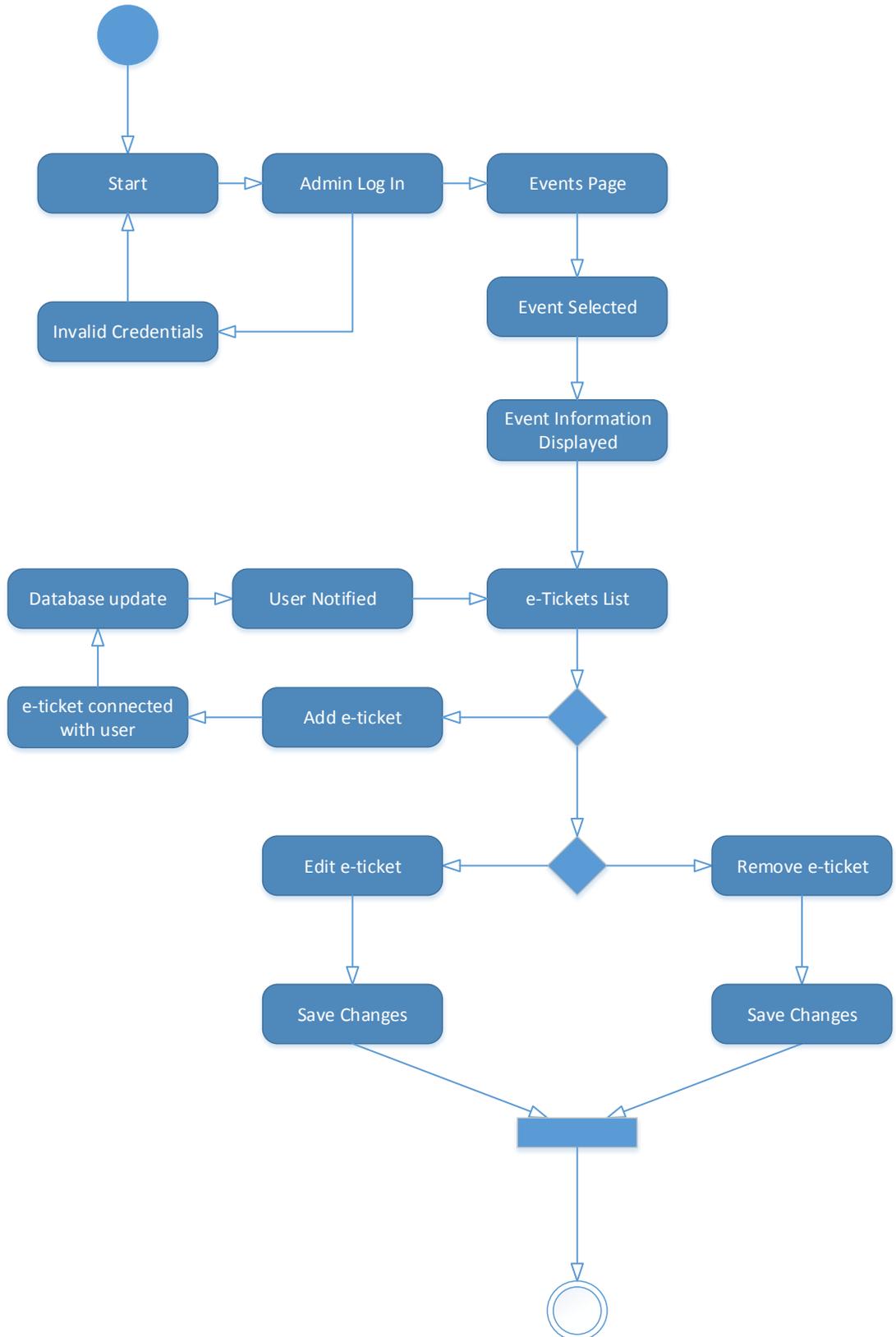


Figure 0.2 - Activity Diagram for e-Ticket ordering



**Figure 0.3 - Making reservations**



**Figure 0.4 - Managing e-Tickets**

### A2 .State Machine Diagrams

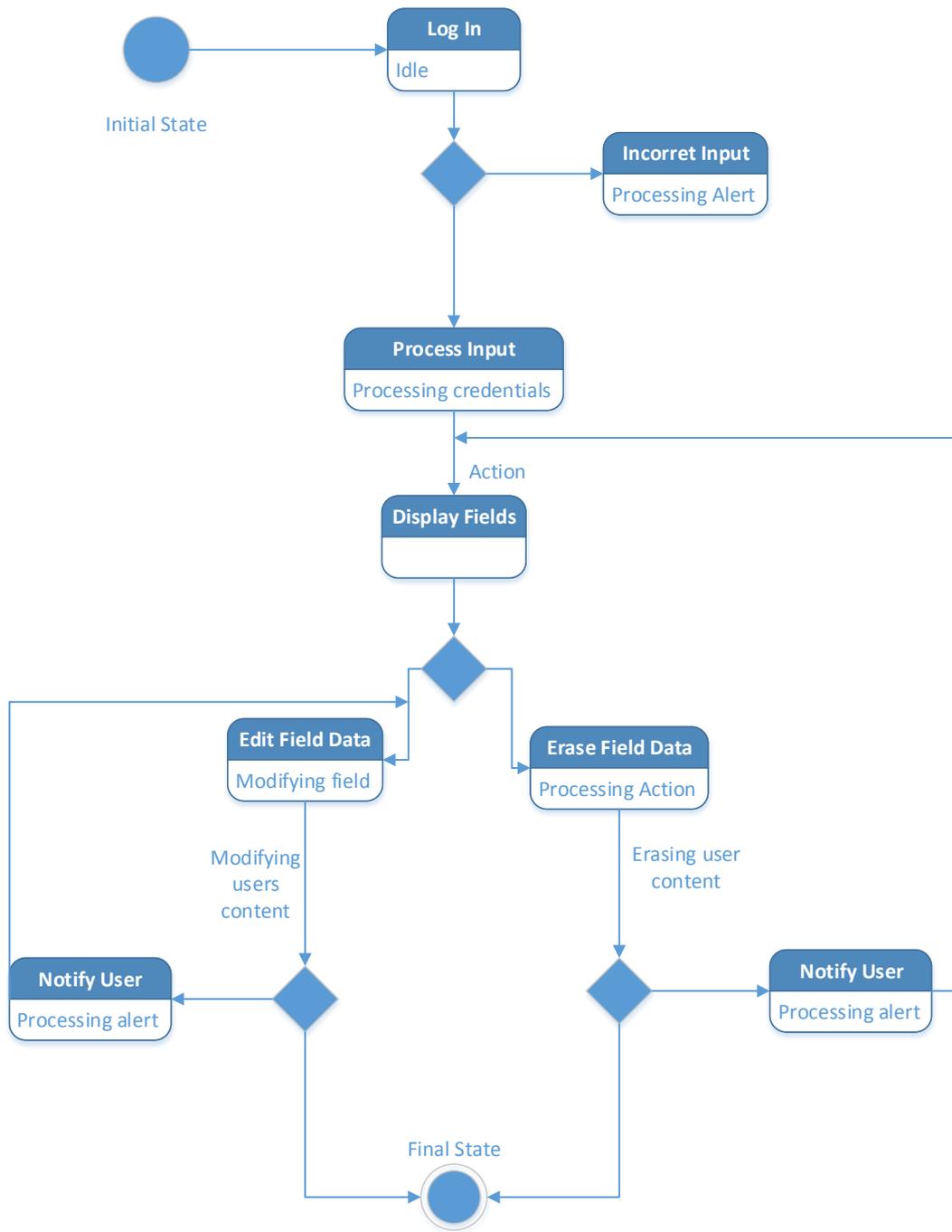
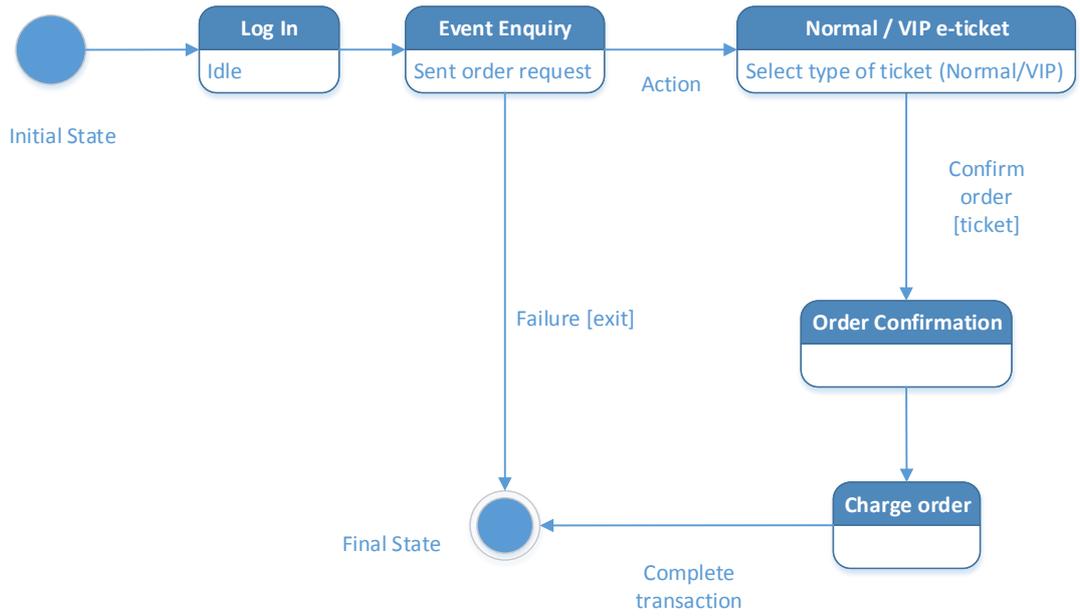
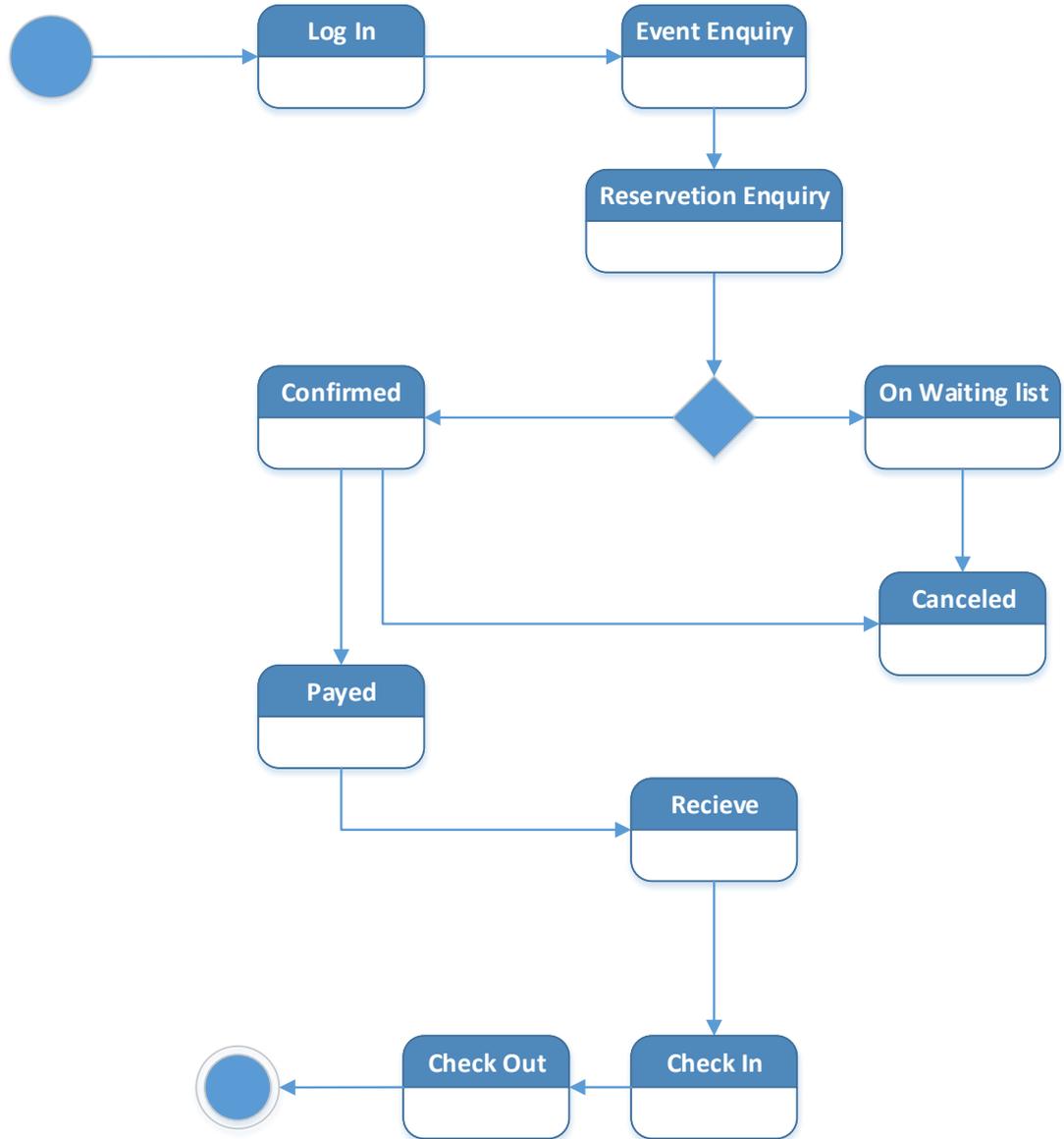


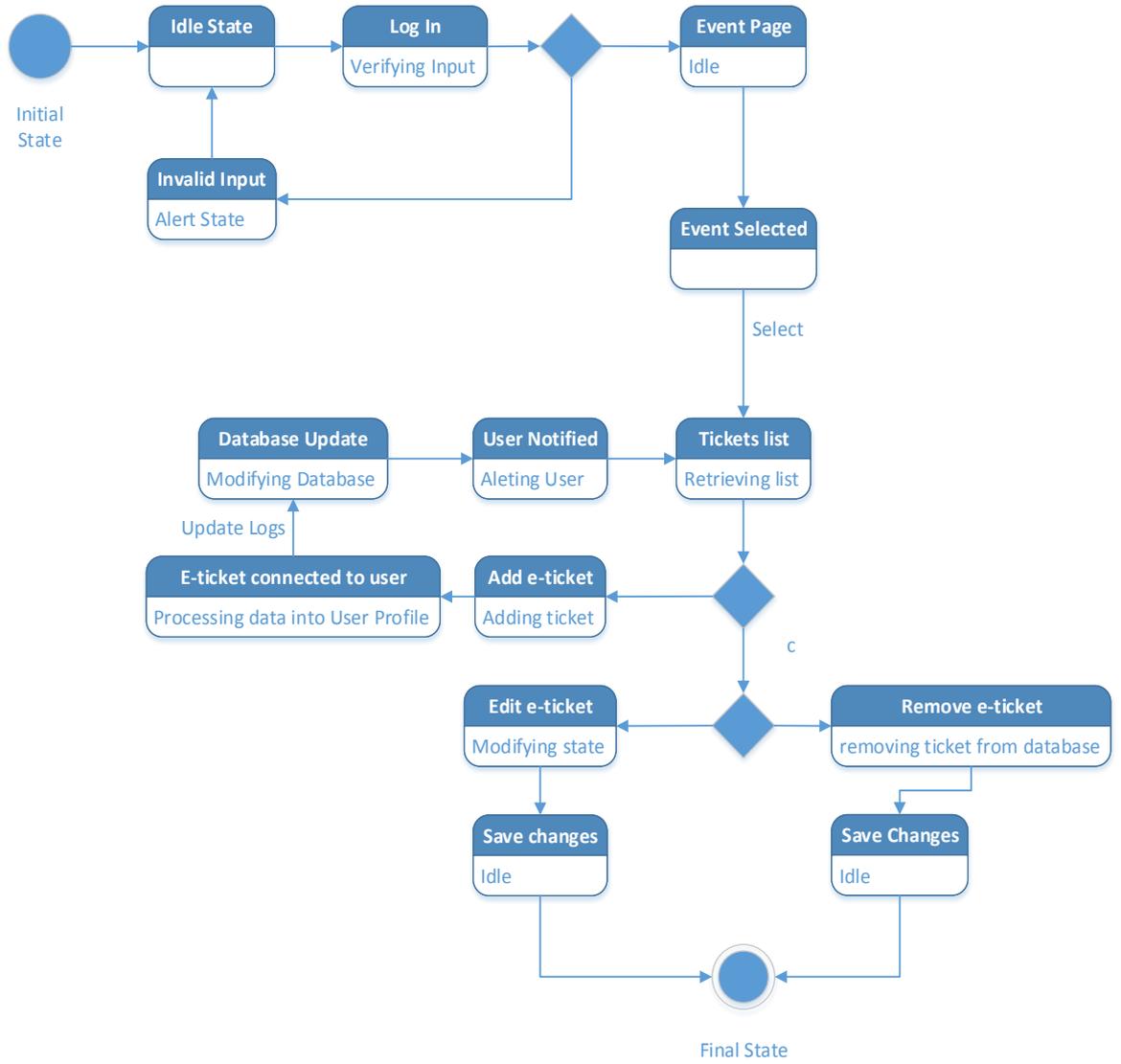
Figure 0.5 - State Machine for Use Case 2



**Figure 0.6 - State Machine Diagram of Use Case 3**



**Figure 0.7 - State Machine Diagram for Use Case 4**



**Figure 0.8 - State Machine Diagram for Use Case 5**

### A3.Sequence Diagrams

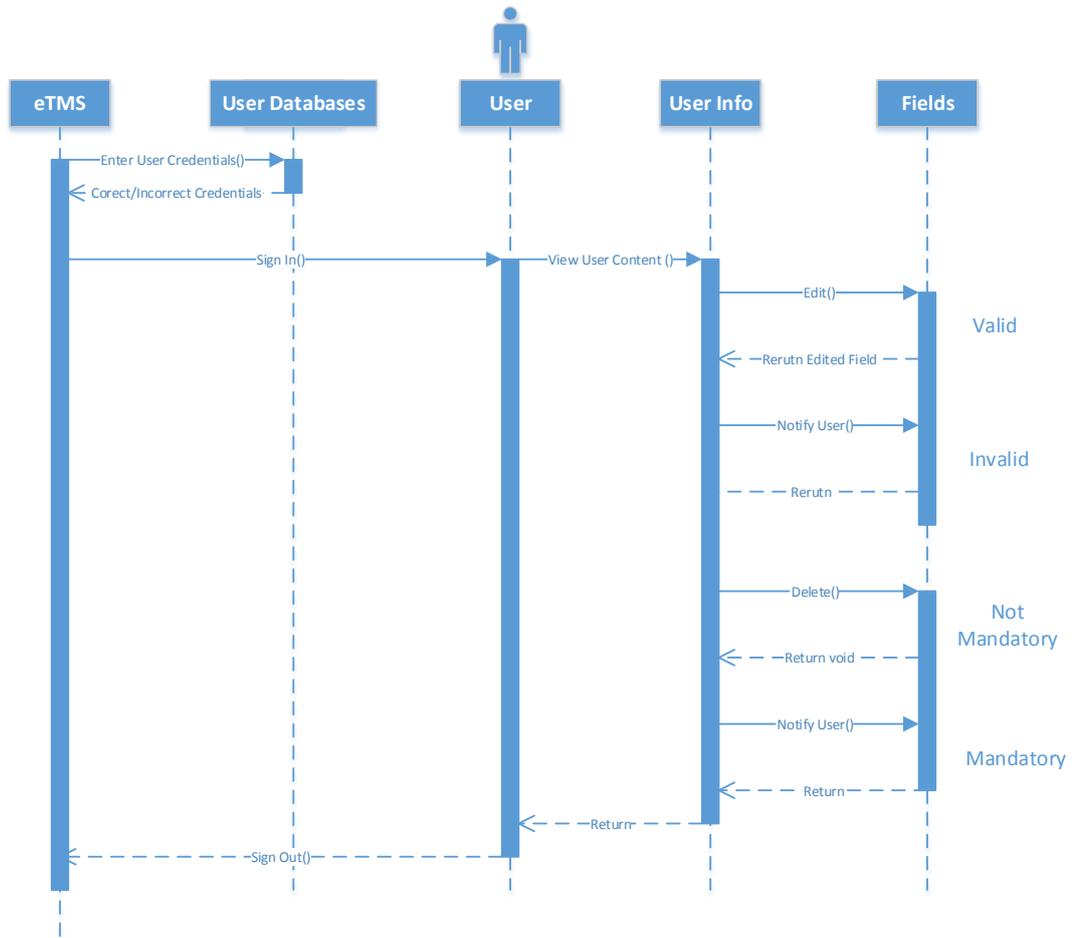
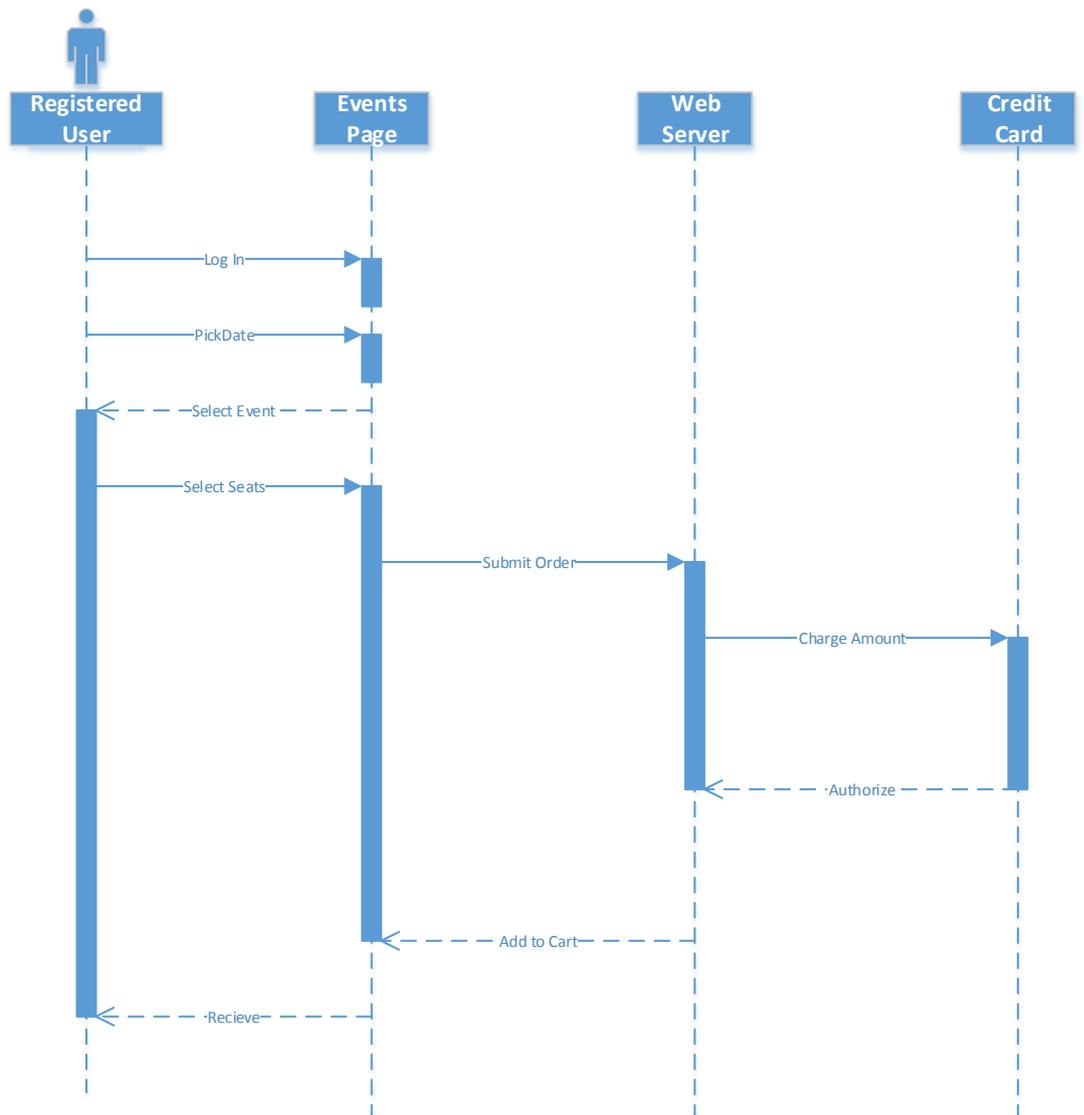


Figure 0.9 - Sequence Diagram for Use Case 2



**Figure 0.10 - Sequence Diagram for Use Case 3**

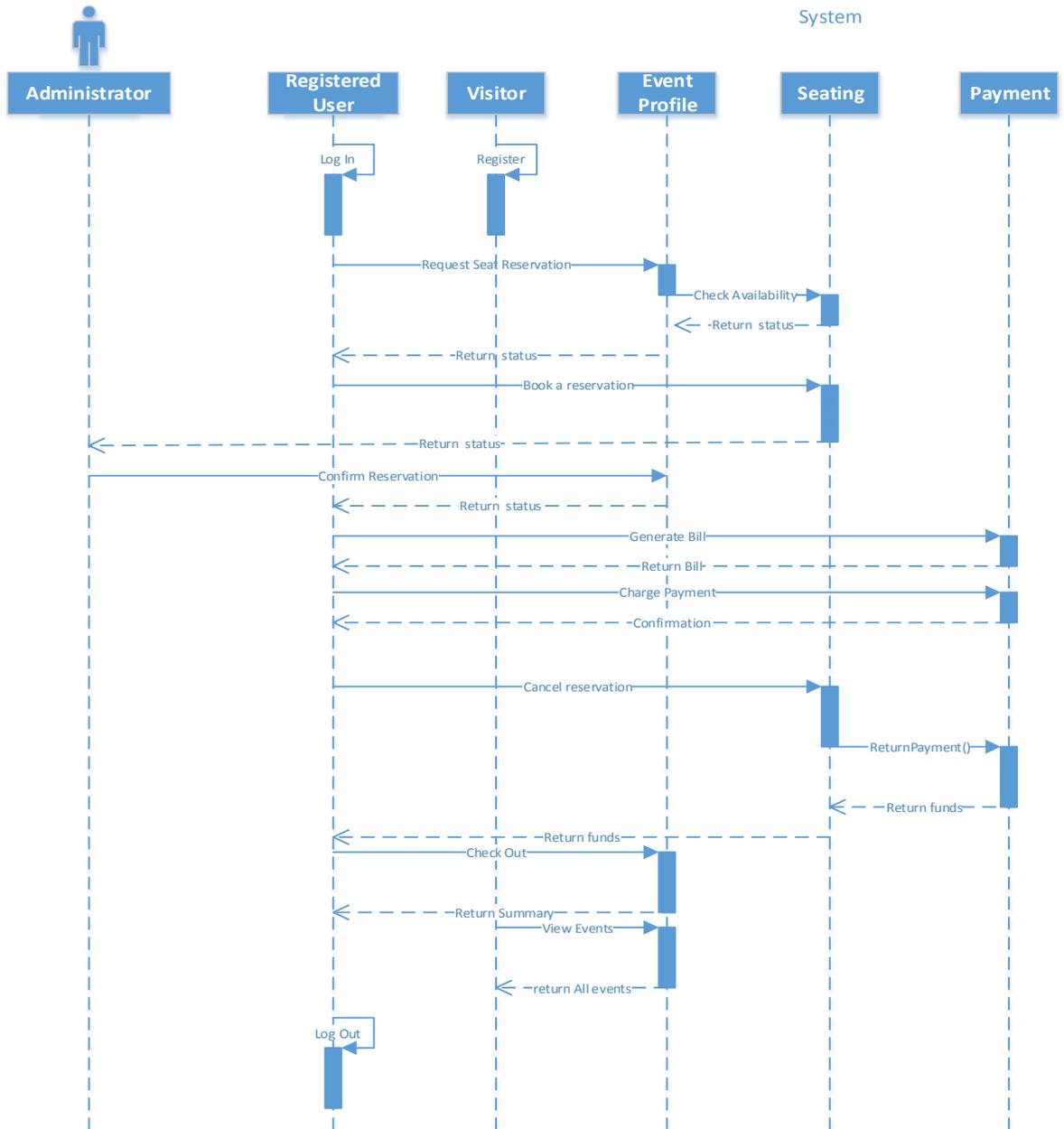


Figure 0.11 - Sequence Diagram for Use Case 4

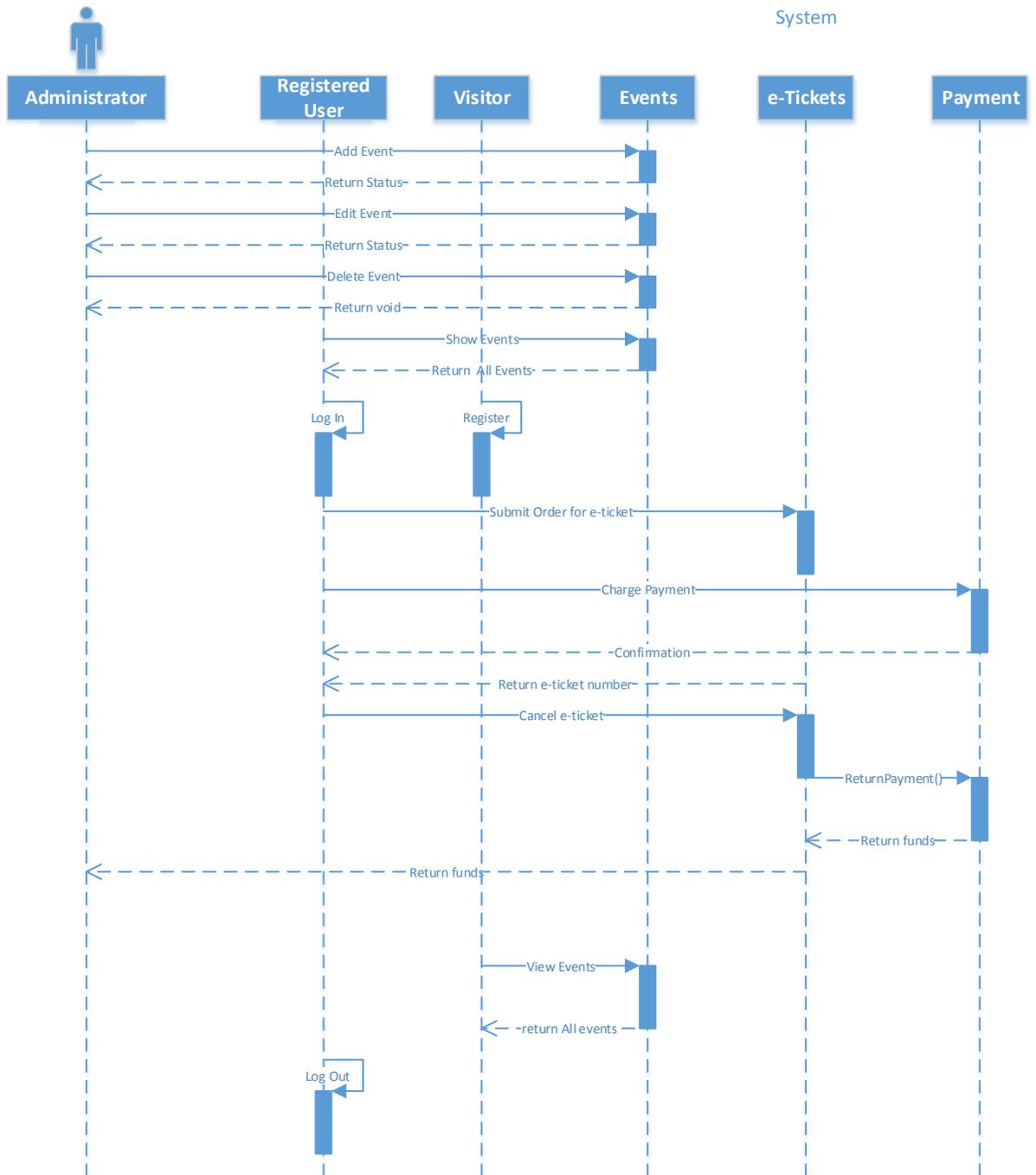


Figure 0.12 - Sequence Diagram for Use Case 5