Yawl, Bicycle and Marathon Race Contestant Monitoring System

A dissertation submitted for the Degree of Master of Information Technology

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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

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Signature: Date:

This is to certify that this thesis is based on the work of

Mr./Ms.

under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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Supervisor Name: **Snr. Lecturer Mr.G. Kapila A. Dias**

_____

Signature: Date:

Abstract

It is cumbersome to monitor Yawl races conveniently as the boats are scattered in water for the majority of the time and are dependent on the level of wind as well. Therefore, an adjudicator is unable to perform his judgments with ease. It is not easy to manage and search contestant information easily and quickly with minimal hassle. Accurate route records of individual races are not recorded. And Marathon and Bicycle races also look like yawl races. They also have route. If race route records are captured can be helpful for contestants of Yawl, Marathon and Bicycle races.

The developed system can capture routes of contestants and provide decision support to adjudicators, Manage contestant data and provide a solution for searching information, Record/track the contestants race routes individually within the system and receive accurate data via GPS technology with mobile, Allow saving race route records of all contestants, Provide a mobile application for the contestants in order to give out the 'start' signal, provide an opportunity for the judges to monitor boat routes, and facilitate the opportunity of graphically reviewing the race.

This system was developed using C# (Microsoft visual studio) as a programming language and MVC design pattern was used with java scripting. Microsoft SQL server express for database. Android Studio was used for mobile application part.

Acknowledgement

I shall take this opportunity to express my sincere gratitude to everyone, including my respected lecturers, colleagues and administration staff of UCSC and whoever else who helped me see my MIT Studies and Project come to a successful completion.

I owe an enormous gratitude to my supervisor Snr. Lecturer Mr. G. Kapila. A. Dias. His guidance right through this project has been so invaluable to me; I am so thankful to his friendly and wiser advice and guidance from the very inception of this project. The encouragement which I received from my supervisor was a key factor for the successful completion of this project.

I shall also thank the Director Asoft Pvt. Ltd., my office friends/partners who supported me in gathering requirements and help me in this project.

I also like to express my gratitude for the MSc Coordinator and the academic staff members of University of Colombo School of Computing for all the guidance given throughout the MIT degree program. I also like to thank all my MIT friends for their support and encouragement.

Last, actually not last I would like to express my heartfelt gratitude to my parents and loved ones for numerous support and being patient with me during last few years.

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List of Acronyms

HTTP	-	Hyper Text Transfer Protocol
ICT	-	Information and Communication Technologies
MDLC	-	Multimedia Development Life Cycle
PHP	-	Hyper Text Pre Processor (Recursive Term)
RDMS	-	Relational Database Management System
RUP	-	Rational Unified Process
RWJMS	-	The Robert Wood Johnson Medical School
SQL	-	Structured Query Language
UCSC	-	University of Colombo School of Computing
UML	-	Unified Modeling Language

CHAPTER 1

INTRODUCTION

1.1 Problem Domain and the Motivation

ASoft Pvt. Ltd is a budding software company in Sri Lanka where they have a project requirement for a 'Yawl, Bicycle and Marathon Race Contestant Monitoring System' from their Norwegian partner.

It is difficult to monitor a yawl race conveniently as boats are scattered in water and may change their path according to the changing flow of the wind. Then the persons who monitor these bots / sailors personal performances are unable to analyse individual race or practice performances in water. Therefore, there is a requirement to implement a new monitoring system (GPS allocated).

Currently they manage the details of their contestants via excel sheets and hard copies of documents. Consequently this takes up a lot of time if they require to search any specific piece of information which results in a lot of wasted time. In some instances, there is a possibility of the records being misplaced as well. Thus they require to manage and search contestant information easily and quickly with minimal hassle.

Currently they do not possess accurate route records of individual races. This is due to the fact that they capture positions of contestants using land marks. In certain instances when this is not possible, they happen to mark it using images. This does not facilitate the capturing of the route positions of all contestants, since it raises practical issues. However, they ideally require to record the race route of all contestants.

When comparing Marathon race and Bicycle race, they are different to Yawl race. If race route records are captured for Marathon race and Bicycle race, it can help Contestants.
At the Yawl race, another requirement of implementing afore-mentioned system is to provide the 'Start' command easily via mobile app. Since a race spans a large area one cannot provide the 'Start' signal for all contestants from only one point. This requires the usage of more than one 'Start' signal points. However this is not accurate and may cause time delays and waste time which is not equitable for contestants.

Implementing a system for all of the three games (Yawl race, Marathon race and Bicycle race) would also have other benefit such as it can capture the contestants who break the rules of the game. Sometime contestants disregard certain rules which the panel of judges cannot easily capture. One purpose of the system is to reduce such practices or abolish it altogether.

The system is also be able to manage the complaints of contestants as well. Some of the complaints can be cross checked with the stored data.

1.2 Aims and Objectives of the Project

Main target of the system is to capture the route positions of contestants and time from beginning to end using GPS technology using a web based solution.
The following are the objectives identified for the project.

- Capture routes of contestants and provide decision support to adjudicators for their decisions.

- Manage contestant data and provide a solution for searching information easily and quickly

- Record/track the contestants race routes individually within the system and receive accurate data via GPS technology with mobile

- Allow to save race route records of all contestants

- Provide a mobile application for the contestants in order to give out the 'start' signal.

- The system also intends to provide an opportunity for the judges to monitor boat routes and which helps for reduce disqualifications

- Facilitate the opportunity of graphically reviewing the race

Furthermore, if an Internet connection for one's mobile is not available, it will get saved locally and only synchronize with server after connection is established with internet. This may be caused in instances within certain areas of race which do not possess proper mobile signals.

1.3 Scope of the Project

The system intends to provide a user friendly and web based monitoring system which is mainly targeted at races. This will assist in monitoring route records of contestants and save respective details of contestants. Furthermore the system expects to introduce a graphical route monitoring and review system using GPS records.

A mobile application will also be developed to gather and send GPS data and provide the 'start' signal as it aims to capture GPS location and give out the start time via mobile. Additionally historic information of races will be kept for future use and analysis purposes.

The system will provide all mobile users with a login in order to identify them and save their historic records of races.

The system functionalities in a nut shell can be depicted as below in a sequential manner:

Web Application consists of the following features.

-Contestants are registered with the system

-Judges are registered with the system

-System users are registered with the system

-Generate graphical and live route interfaces for individual contestants and another view with all contestants.

-Generate graphical review route interfaces for individual contestants and another view with all contestants.

-Generate reports of contestant details using the web system

-Contestants should be able to review the history of records, routes via maps pertaining to races.

Mobile Application consists of the following features.

- Contestants login via mobile app.

- Tracking must be carried out via GPS

- Save tracked record via GPS and upload to server automatically via mobile internet.

CHAPTER 2
BACKGROUND

2.1 Existing systems

To implement this system, examining existing projects have helped in many ways.

There are some systems for bicycle races such as“Timing Systems for Road Cycling & Velodrome Races” [26]. But they use camera and some RFID technology to capture result. Also there are systems for running events. RFID Race Timing System is an example [27]. Above mention systems, can’t track all of the events. They capture selected points. There capture race start and end point mainly.

2.2 Weakness of existing systems

The following are the weaknesses of the current system.

- The “RFID Race Timing Systems” looked at, has the following scope.

  “A running race may have start, intermediate and finish line timing points. RFID became mandatory in the 1990’s as the running boom exploded and manual timing could not cope with the large number of runners finishing at the same time. RFID also makes it fairer for runners to be given a NET time when they cross the start line, not when the gun goes off. UHF technology is now the number one technology used for mass participation running events but is equally at home with small weekly club races.”

  There method is, a running race when separate start and finish lines (but no midway splits) may look something like the depiction below in Figure 2.1. [27]

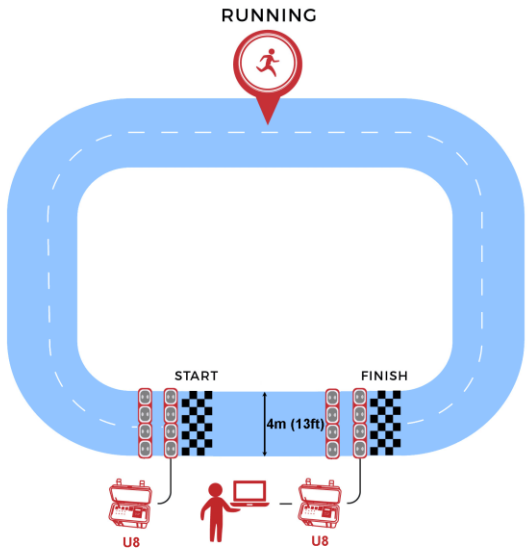

Figure 2.1 : Method Structure [27]

In this system, data is captured only at start and end points. It does not capture runner data during the race. If any participant did cheat (use wrong path), can't capture it via the system. It is the main weakness, so it does not match to our purpose.

- "Timing Systems for Road Cycling & Velodrome Races" is based on capturing photos at end/finish line. This is very accrue system. And it is used in world-Class venues like Beijing National Stadium and the Velódromo Mallorca and also Tour de France, USA Cycling Olympic Trials, Tour de Langkawi, Tour of Spain (Vuelta a España), and Tour of Beijing. The following figure (in Figure 2.2 [26]) showing results captured at the Tour de France.

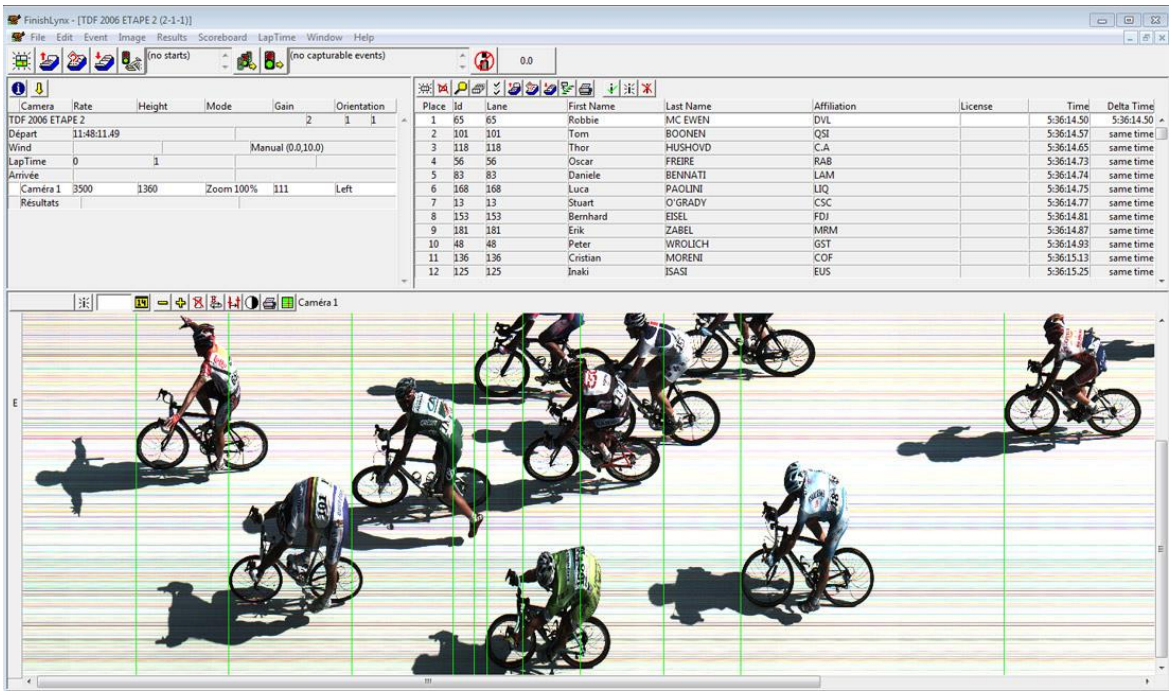

Figure 2.2 : Showing results captured at the Tour de France. [26]

Above system targets only the end point / finish line and just to identify the correct winner. Therefore, this system has some kind of drawbacks such as individual performance does not count during the race. E.g. Best cycle rider for mountain hiking. When designing the system individual performance of every participants and all the necessary information during the race have to be monitored.

CHAPTER 3
ANALYSIS AND DESING

3.1. Introduction to analysis

Analysis is the most significant phase of the software development life cycle. It will help developers to get a clear idea about the problem domain and what are the user's requirements for the new system before start developing.

The way of required information gathering, analyzing of gathered information and management techniques of analyzing information are explained in this section.

In addition to that functional and non-functional requirements of the proposed system, difficulties in completing requirements and how to overcome them in the best possible way are also denoted. This section also interprets what are the best method to develop the system, what technologies have to be used and what tools are required to develop the system.

3.2. Requirement gathering and fact finding

Purpose of every system is to full fill the needs of user/client. Those needs named as requirements of the system. To have the clear idea about the requirements, analyst must go through the existing system and must collect details from every stake holders.

Gathering requirement can be done by following various fact finding techniques like interviews, questionnaires etc.

3.2.1. Background reading / Inspect documents

Having good understanding of the organization's processes will leads to get a good understanding about requirements.

You can have a good understanding in background of the requirement via inspecting reports, and other documents related with current process. It is used for design the database and identifies the fields of the tables' structure easily.

3.2.2. Interviewing

With this technique analyst can collect the information from groups or individuals. In this system, by interacting face to face with the current administration officers / organizing peoples , selected group of users who will work with the system and racers who use the mobile app, and their responses have provide valuable ideas about the usability of the system and current difficulties with the manual system.

3.2.3. Observation

By watching user's and their normal work flow carrying out their operations to learn about system, participating various activities such as racers registration, how to schedule race etc. have helped to gather much needed information's for the development.

Observation is useful to validate collected data.

Had few problems with this technique because some users don't like being observed and some behave differently while observing.

According to our case we can't do it direct, because we gather data via a third party.

3.2.4. Questionnaire

Asking collection of questions form users that helps to identify the requirement of the system.

3.2.5. Prototyping

By showing prototype of the system, functional and non-functional requirements of the system. Since it shows the prototype to users, users may think that the system is about to be completed. We tried it with the third part users.

3.3 Product perspective

Benefits of the web based applications

- Platform independent

- Online services

3.4 Technology captured for software development

Development of the web based system using new technologies such as HTML, Asp.Net, C#.Net, CSS, MsSql, java scripts, DNN.

3.4.1 HTML

Hyper Text Markup Language (HTML) is the main markup language for web pages. HTML elements are the basic building-blocks of web pages.[41]

3.4.2 ASP.NET

ASP.NET is an open source web framework for building modern web apps and services with .NET. ASP.NET creates websites based on HTML5, CSS, and JavaScript that are simple, fast, and can scale to millions of users. [39]

3.4.3 C#

C# (pronounced "C sharp") is a programming language that is designed for building a variety of applications that run on the .NET Framework. C# is simple, powerful, type-safe, and object-oriented. The many innovations in C# enable rapid application development while retaining the expressiveness and elegance of C-style languages. [40]

3.4.4 MsSql

MS SQL Server is a relational database management system (RDBMS) developed by Microsoft. This product is built for the basic function of storing retrieving data as required by other applications. It can be run either on the same computer or on another across a network. This tutorial explains some basic and advanced concepts of SQL Server such as how to create and restore data, create login and backup, assign permissions, etc. Each topic is explained using examples for easy understanding.[42]

3.4.5 IIS

IIS (which stands for Internet Information Services or Internet Information Server) also known as Windows web server is available on most versions of Microsoft Windows operating systems and takes second place in overall usage behind Apache HTTP Server on the internet. It will host websites, web applications and services needed by users or

developers. Many versions have shipped as far back as IIS 1 on Windows 3 and with nearly every new Windows OS a new IIS version follows. [43][44]

3.4.6 DotNetNuke(DNN)

DNN (formerly DotNetNuke) is a web content management system based on Microsoft .NET. The DNN Platform Edition is open source.

DNN is written in C#, though it existed for many years as a VB.NET project.[5][6] It is distributed under both a Community Edition MIT license [4] and commercial proprietary licenses as DNN Evoq Content and DNN Evoq Engage editions. [45][46]

3.5. Requirement analysis and management

Requirement management is a critical task. The gathered requirements should be analysed and must check for ambiguities to be solved, otherwise it will lead the system to a problematic stage later.

In this the process of maintaining document of system, analysing, tracing, prioritizing tasks and agreeing on requirement changes. Accepting new requirements unconditionally, will affect the project quality and it will lead to project delays.

3.6 Requirement gathered from analysis

3.6.1. Functional requirements

The following are the functionalities identified for the system

1. Contestants are registered with the system
2. Contestants must login to the system via the mobile application
3. The ‘start’ signal must be sent to the mobile application via the web system
4. Boat tracking must be carried out via GPS
5. The records received by tracking via GPS must be saved within the system

6. Generate graphical and live route interfaces for individual contestants and another view with all contestants.

7. Generate graphical review route interfaces for individual contestants and another view with all contestants.

8. Generate reports of contestant details using the web system

3.6.2. Non-functional identifier

- User friendliness

System directly interact with staff members, foreign agents. They must have opportunity to work without any droughts. System colour theme should be attractive, font size must be readable, easiness of finding functionalities in the system, having meaningful icons, providing messages of their works going to done Etc.

- Reliability

The system has the ability to work all the time without failures other than network failure will increase rely of the racers on the system.

- Security

The security of the system will be high in order to protect racers confidentiality of their some personal details.

- Performance

System should provide accurate information quickly as the response time is very important in real time systems.

o Hardware and software implementation of the system

Hardware:

Server (for setup system) it wants with good RAM

4GB RAM

1000GB Hard disk (Good hard space)

Android mobile phones with good RAM 1GB RAM

1.0GHz dual core processer

Software's:

Microsoft Windows Server 2012

IIS HTTP server

MsSQL 2012 or above

Java

- Capacity

Racers will upload GPS track data/ positions from their mobile. The capacity of the server must be high to support this feature.

- Inter-operability

System should have the ability to work with the other applications. Example: To get printouts from system, it should be compatible with Printer facilities.

- Robustness

The entire system includes every function which always helps the system to work correctly & strongly in all conditions.

3.7. Introduction to design

System design phase produces the design specification for the system to be implemented. Well drawn diagrams will make the designer's work easy. For example having class diagram will lead database designer's work easy.

There are several methodologies that can be used to while developing a system like waterfall method, spiral method, agile methodology etc.

For this system implementation, Rational Unified Process (RUP), an iterative development methodology is the best methodology. selected because Yawl Race Monitoring System have higher risk of requirement changing through the project duration.

3.8 System Architecture

The system architecture for the system is given below in Figure 3.1

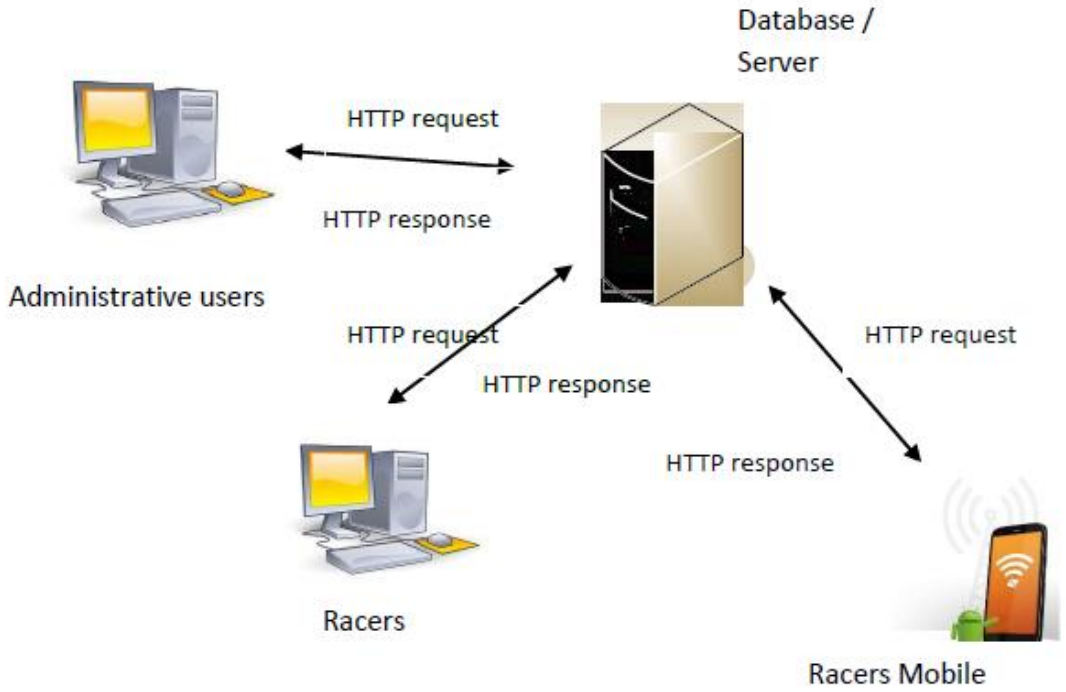

Figure 3.1 : System structure

3.8.1 Development Approach

Rational Unified Process (RUP) is the methodological approach which will be used in the proposed system. It is an iterative software development framework created by Rational Software Cooperation (See Figure 3.2). This process consists of 4 phases. Namely,

1. Inception – Identify the system scope by gathering the user requirements correctly. Business case is established. Should be concerned about the cost/schedule estimate, risk assessment etc.

2. Elaboration – Mitigate the key risks identified from the previous stage. Develop an overall project plan. Complete the use case diagrams up to 80%.

3. Construction – Main focus is on the development of the codes.

4. Transition - End user training and acceptance testing is carried out here.

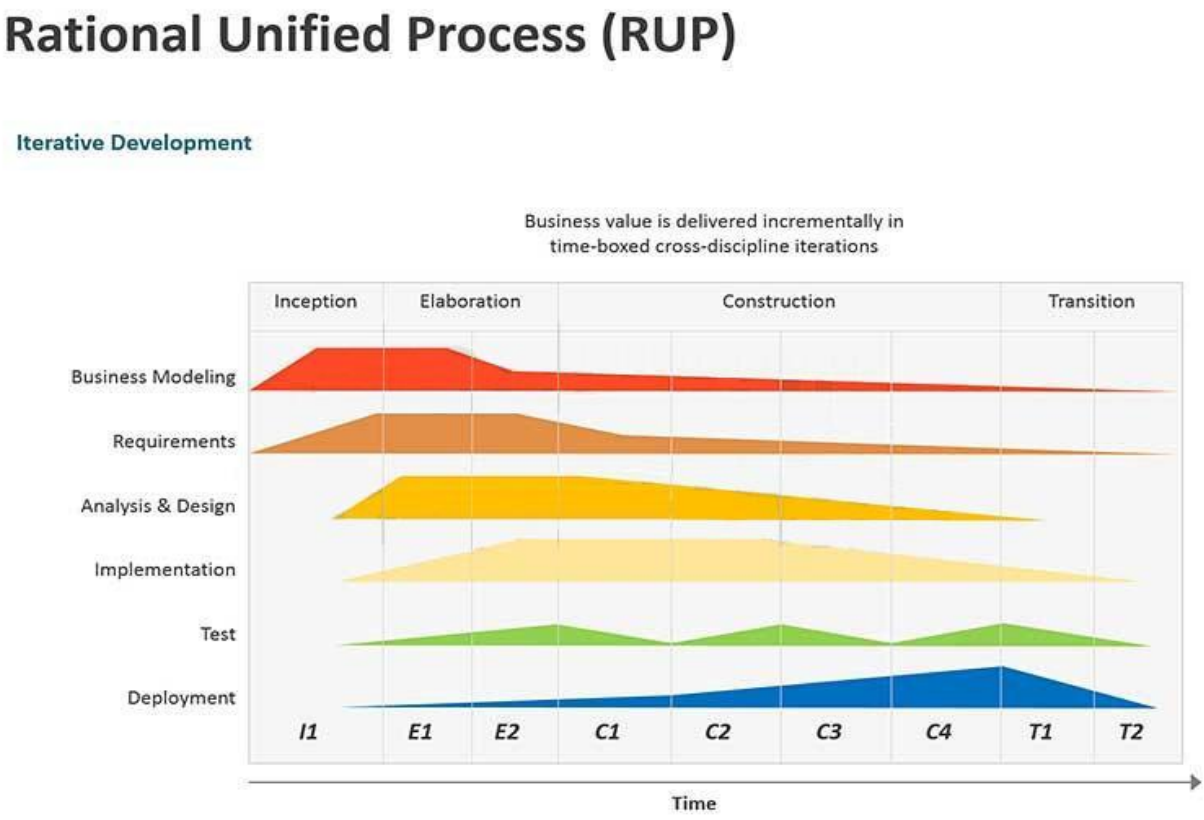

Figure 3.2: RUP [1][2]

Yawl Race Monitoring System is a web base solution on client server architecture. And also it has a mobile application. System administrator/Operator have access from anywhere to the system. But racers have access with limited features as view race reports.

3.9 High-level use case diagram for the system

Top level Use Case diagram for the is given in Figure 3.3.

Figure 3.3 : Use Case Diagram

User case narratives for racers registration is given in Table 3.1.

Use Case ID	01		
Use Case Name	Racers registration.		
Created by	Tharanga MAL	**Last Update by**	Tharanga MAL
Created Date	01-07-1205	**Last Revision Date**	01-07-1205
Actors	Administrator, Operator		
Description	New Racers registration.		
Preconditions	Local network should available. System is working without crashes. Internet should available for users if allow to use system from outside the office.		
Post conditions	Successfully register racers in the system		
Main Scenario	1. Login to system as Administrator or Operator. 2. Searching racers details on system by using their Identity Card Number to confirm the racers are new or existing. 3. If don't have any record for racers National Identity Card Number proceed new racers registration by clicking "racers registration" button. 4. System shown the all features of the registration process. 5. Operator / administrator enter details to system using racers registration form. 6. After filling the required details click "register" button. 7. Feedback message from system whether the registration success or not. 8. Direct into customer profile after successful registration.		
Alternative Scenario	2(a) 1. If customer detail exist on system notify when staff member trying to register as new racers		

Table 3.1 : Use Case Narrative for Registration

3.10 Sequence Diagrams

Sequence diagram for racers registration is given in Figure 3.4.

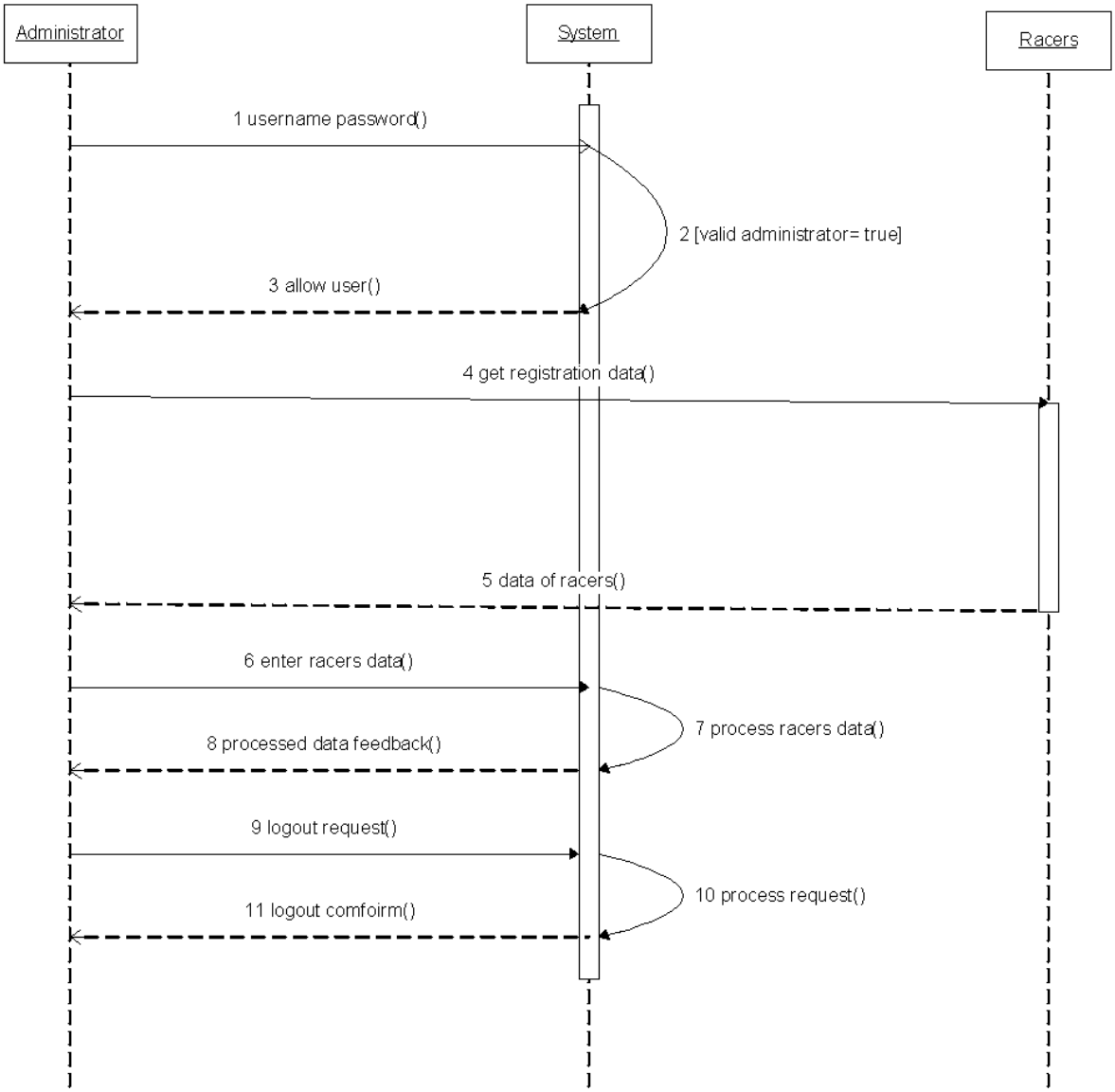

Figure 3.4 : Sequence Diagram for Registration

3.11 Class Diagram

The basic level, draft Class diagram for the system is given in Figure 3.5.

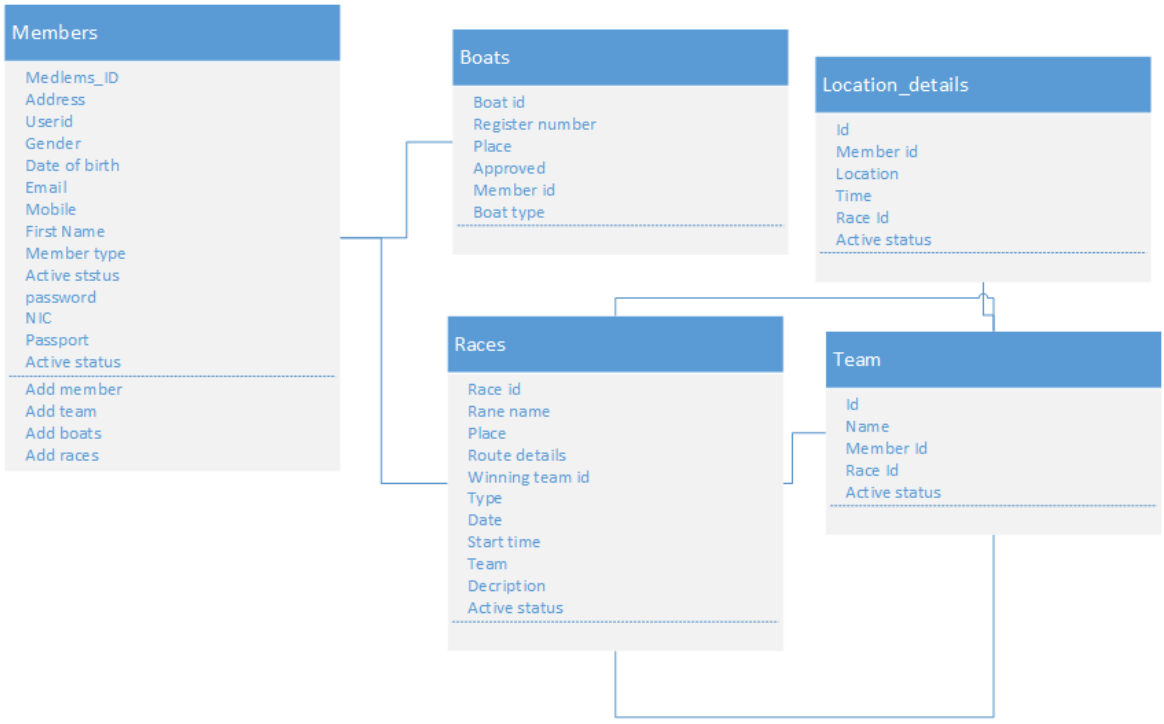

Figure 3.5 : Class Diagram

3.12 Activity Diagram

- Web User

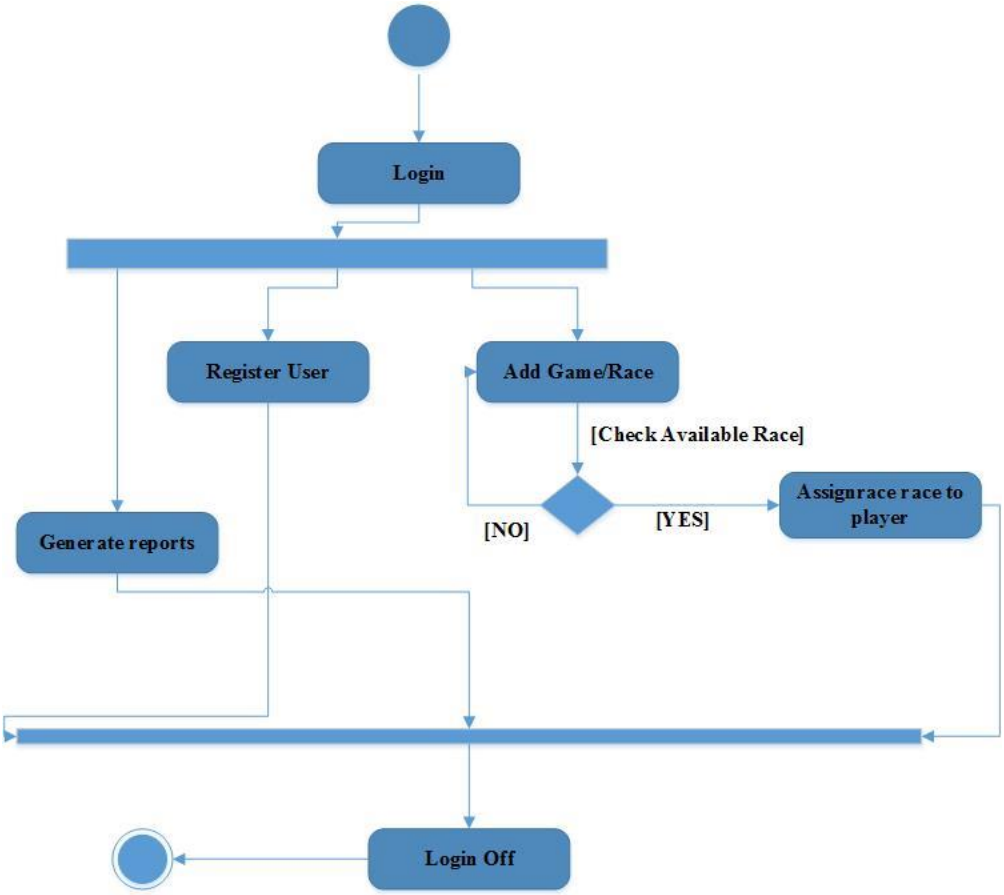

Figure 3.6 : Activity Diagram – Web User

- Mobile User

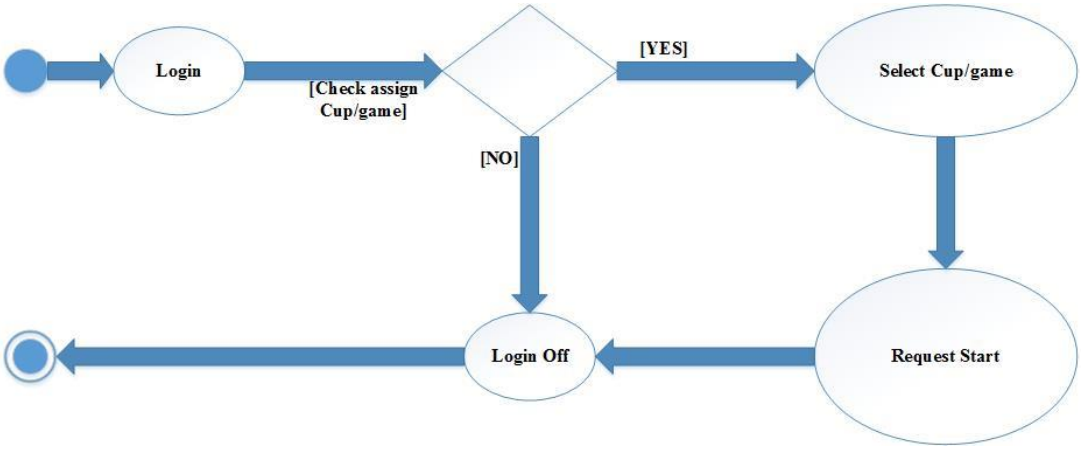

Figure 3.7 : Activity Diagram – Mobile User

3.13 Database Design

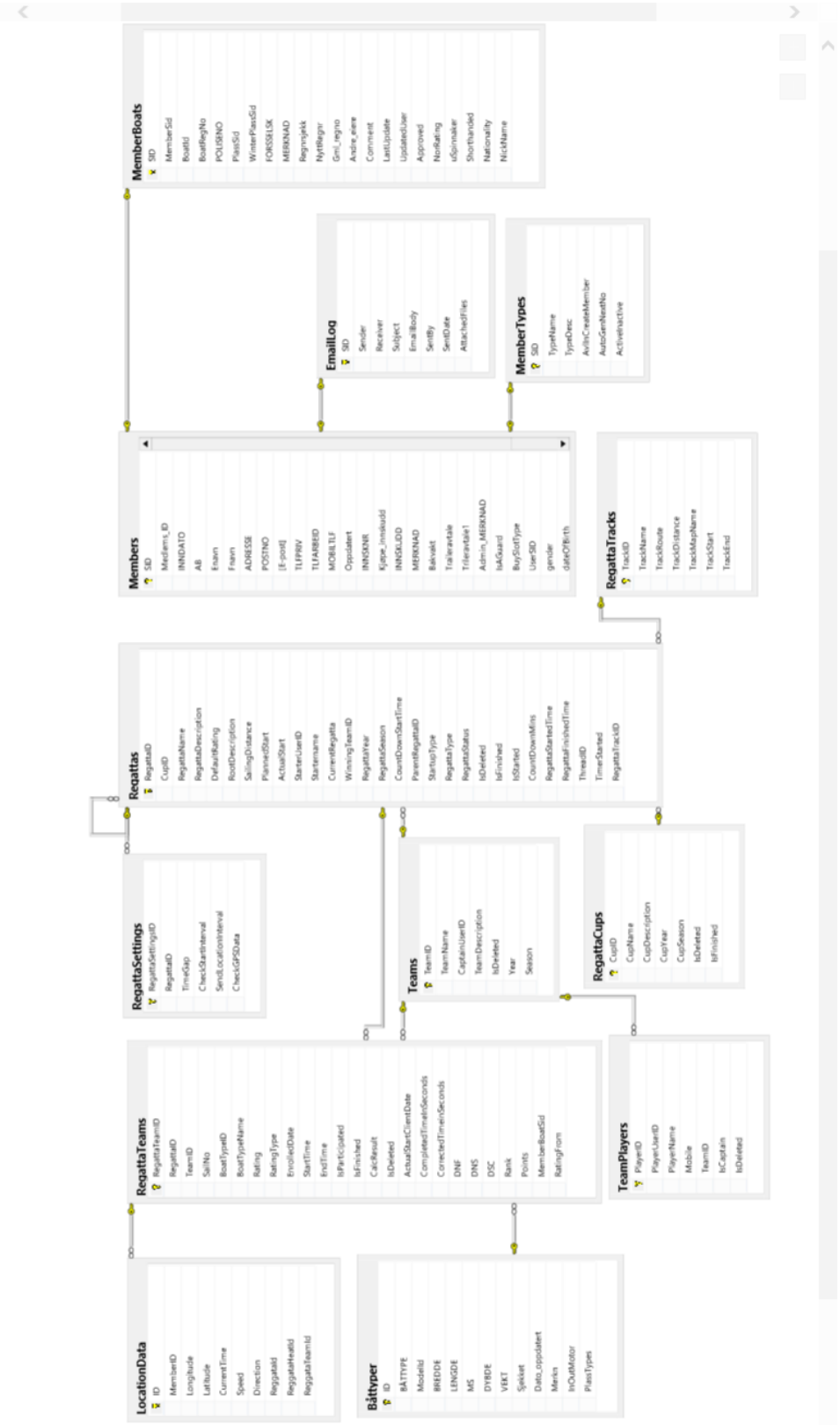

Figure 3.8 : Database Diagram

3.14 User Interface Design

Below figure (in Figure 3.9 : Login Window) is login window and some other user interfaces have at Appendix C

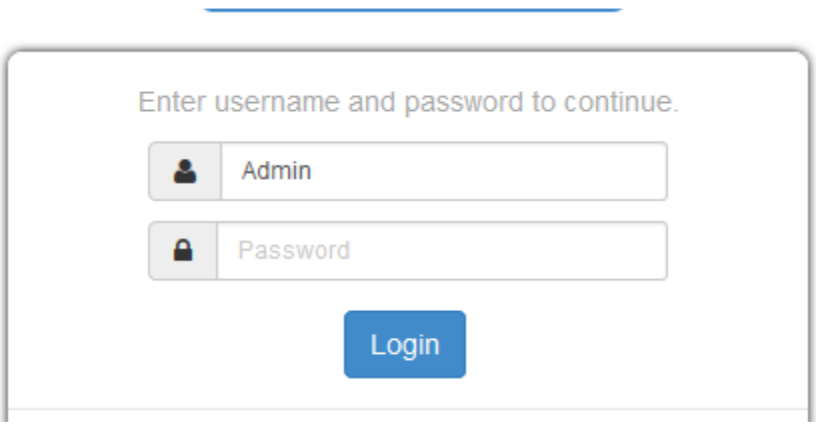

Figure 3.9 : Login Window

CHAPTER 4

IMPLEMENTATION

4.1 Introduction

This chapter will explains the changes in flow of the project, mile stones of the project as well as difficulties have faced up to now.

The below section explains the hardware and software requirements for the server side implementation.

Hardware	Software

• Server machine
  ○ RAM 4GB RAM
  ○ 1000GB Hard disk
  ○ Core I 5 or higher
 	
• Android mobile phones
  ○ RAM 1GB RAM
  ○ 1.0GHz dual core processer
	Microsoft Win8 or Microsoft server 2012 or higher
	IIS
	MsSQL 2012 or higher
	Android version 4.1 or higher

Table 4.1 : Requirements

4.2 Tools and techniques used for implementation

4.2.1 Main languages and services used for implementation

Programming language	C#	[28]
Markup language	HTML, CSS	[29]
Scripting language	Java scripts,	[30]
Database	MsSql	[31] [32] [33]
Server	IIS	[34] [35]

Table 4.2 : Languages

4.2.2 Software used for implementation

Code development	Visual Studio 2013	[36]
Code development	Android Studio	[37]
Database management	SQL Server 2014 Management Studio	[38]
Image editing	MS Paint	

Table 4.3 : Software used for implementation

4.2.3 Database

- Microsoft SQL Server Express 2014

4.2.4 Others Technologies

The following are the other used technologies ……

- Bootstrap

"Bootstrap, a sleek, intuitive, and powerful mobile first front-end framework for faster and easier web development." [7]

- Google Maps APIs

"Google Maps APIs are available for Android, iOS, web browsers and via HTTP web services." [8]

- Jason

"Jason is a platform for the development of multi-agent systems." [4] [5] [6]

- Ajax

"Update a web page without reloading the page Request data from a server - after the page has loaded Receive data from a server - after the page has loaded Send data to a server - in the background" [3]

- Datepicker js Plugin

A js modules which facilitates the user to pick a date from the calendar.

- Entity Framework

“Entity Framework (EF) is an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects. It eliminates the need for most of the data-access code that developers usually need to write. Get it Add this to your project and start taking advantage of this powerful O/RM.” [9]

- Google Charts

Google chart tools are powerful, simple to use, and free. Google charts are used to plot simple bar charts and column charts. [24]

4.3 Database Implementation

Database is a collection of similar related data which is organized as tables. Databases are having a major impact on the any kind of software system from small to large and dynamic systems. It is reasonable to say that the database plays a vital role in almost all areas where systems are used including business, engineering, scientific, management etc.

“The data design transforms the information domain created during analysis into the data structures that will be required to implement the software. The data objects and relationships defined in the entity relationship diagram and the detailed data content depicted in the data dictionary provide the basis for the data-design activity.” [25]

4.3.1 Examples for some stages of Microsoft SQL development

Below figures shows some stages of Sql developments.

- Create Database

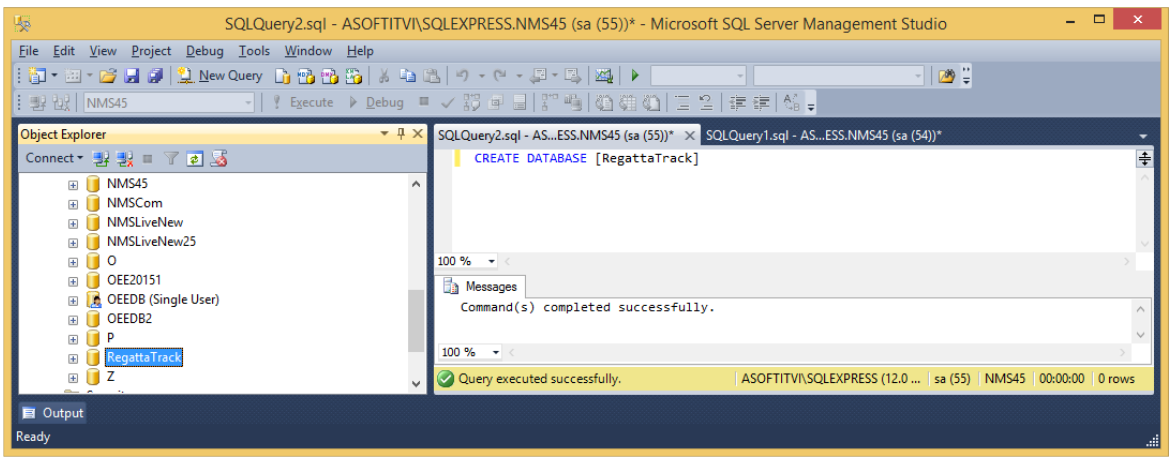

Figure 4.1 : Create Database

- Create Table

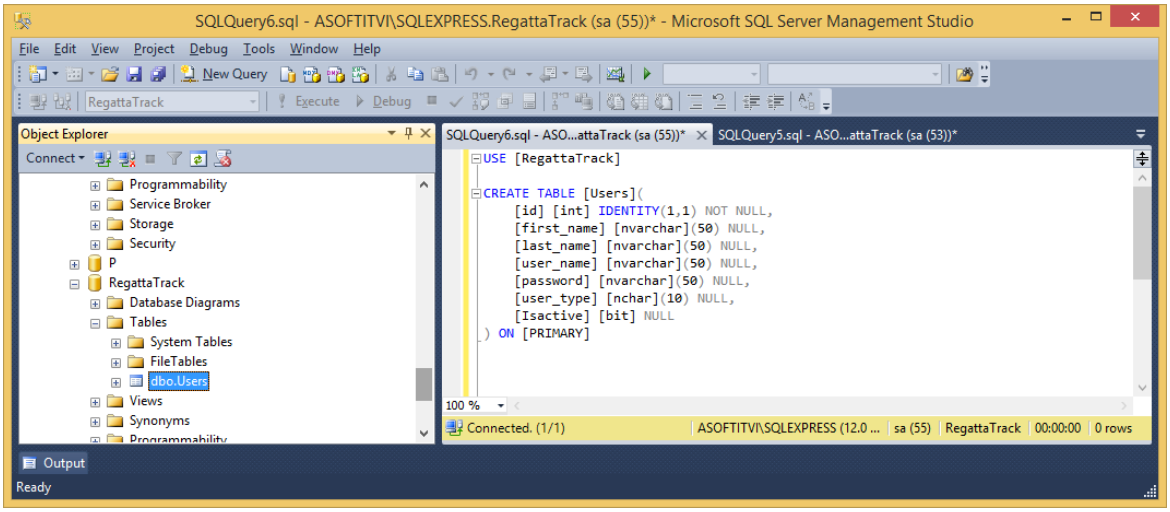

Figure 4.2 : Create Table

4.4 User Interface designs

4.4.1 Login

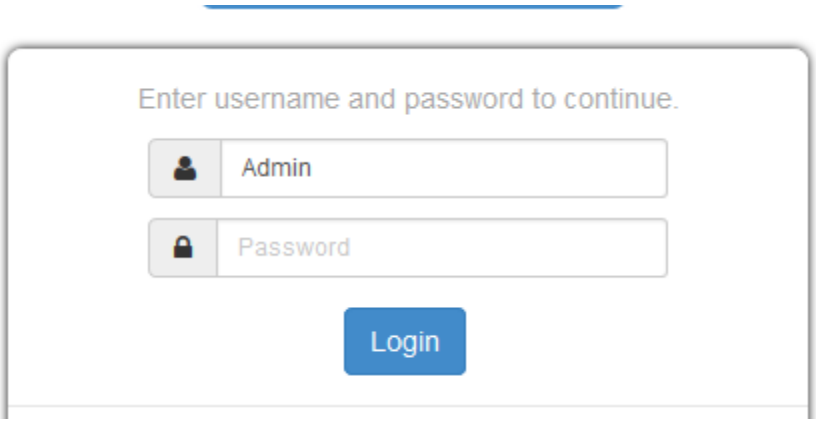

Figure 4.3 : Login Interface

4.5 Code segments

4.5.1 Login process (at HomeController)

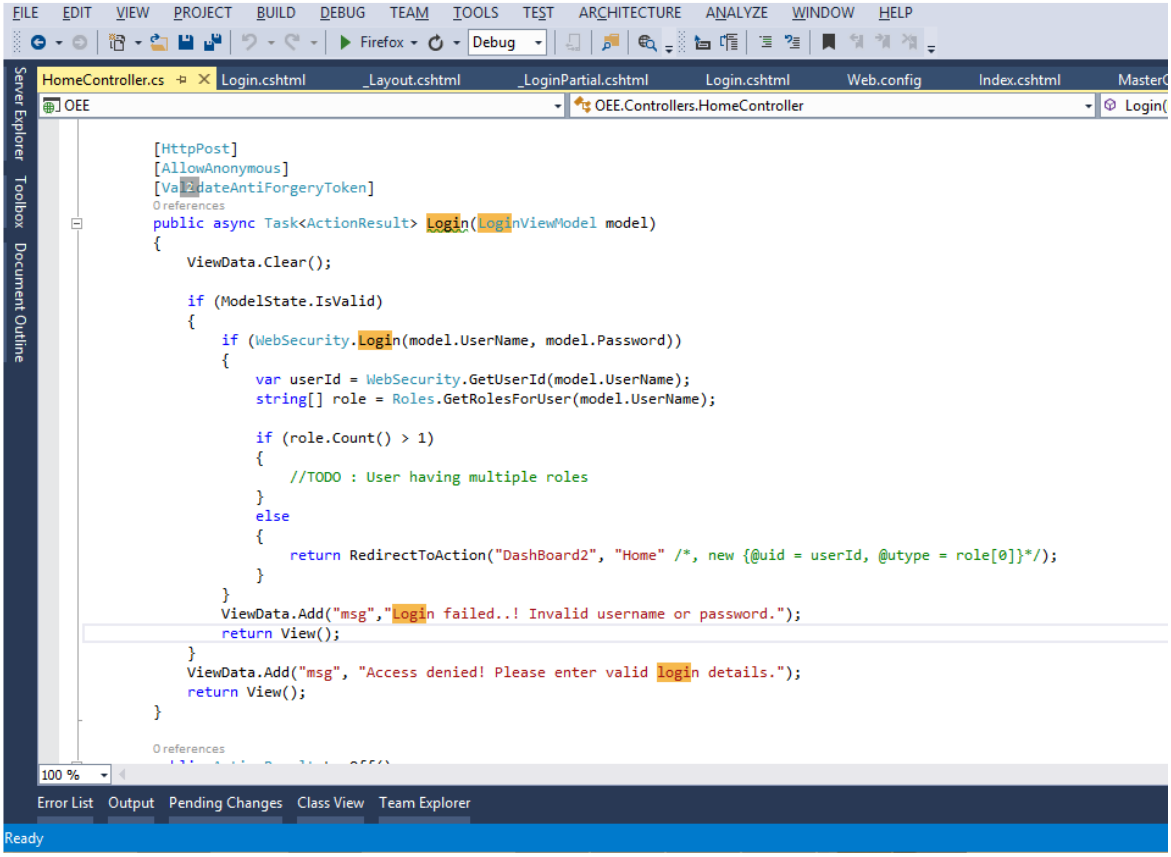

Figure 4.4 : Login Code

4.6 File formats in application (extensions)

.chtml	html file (MVC)
.cs	C# file
.rpt	Crystal report file
.java	Java file
.apk	Android installation file
.png	PNG image file
.gif	GIF image file

Table 4.4 : File formats

4.7 Summery

This chapter shall include the aspects such as selection of implementation technology (languages, platforms, frameworks, platforms etc.) and the justification for the choices

Next chapter will contain evaluation and testing.

CHAPTER 5
EVALUATION

5.1 Introduction

The solution has to be verified and validated to certify the quality of solution. This process is involved in this chapter.

5.2 Software Testing

“Testing is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not.

Testing is executing a system in order to identify any gaps, errors, or missing requirements in contrary to the actual requirements.

This tutorial will give you a basic understanding on software testing, its types, methods, levels, and other related terminologies.” [10] [11] [12]

In there have Verification and Validation

Verification	Validation
Verification addresses the concern: "Are you building it right?"	Validation addresses the concern: "Are you building the right thing?"
Ensures that the software system meets all the functionality.	Ensures that the functionalities meet the intended behavior.
Verification takes place first and includes the checking for documentation, code, etc.	Validation occurs after verification and mainly involves the checking of the overall product.
Done by developers.	Done by testers.
It has static activities, as it includes collecting reviews, walkthroughs, and inspections to verify a software.	It has dynamic activities, as it includes executing the software against the requirements.
It is an objective process and no subjective decision should be needed to verify a software.	It is a subjective process and involves subjective decisions on how well a software works.

Table 5.1 : Verification vs Validation

5.3 Testing methods

There have two type

- Static testing - verification
- Dynamic testing – validation

5.3.1 Static testing

“Static testing is a software testing method that involves examination of the program's code and its associated documentation but does not require the program be executed. Dynamic testing, the other main category of software testing methods, involves interaction with the program while it runs.” [13] [14] [15]

White box testing

- This is use for verification.
- Consider internal process.

5.3.1.1 Types of Reviews

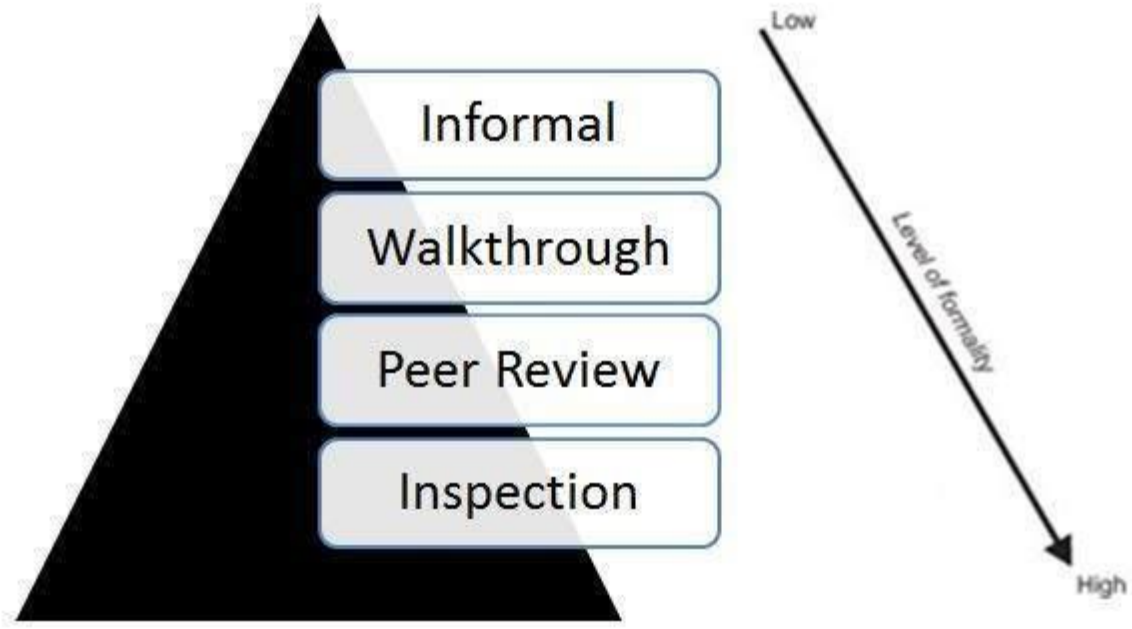

Figure 5.1 : Types of Reviews [23]

5.3.2 Dynamic testing

"Dynamic Testing is a kind of software testing technique using which the dynamic behaviour of the code is analysed. For Performing dynamic, testing the software should be compiled and executed and parameters such as memory usage, CPU usage, response time and overall performance of the software are analyzed." [16]

In there have Black box and White box testing

Black box

- This is use for validation.
- In this test focus to the output.
- Not consider internal process.

5.3.2.1 Dynamic Testing Techniques

There are generally categorized into two categories

- Functional Testing
- Non-Functional Testing

5.3.2.2 Levels of Dynamic Testing

There are different levels,

- Unit Testing
    - Unit testing can be described as verifying individual modules or components of the software, whether they are behaving as specified. Normally it's done by the programmers while they are developing. To do that needs detail knowledge of the internal program design and code. Unit testing proceed periodically, often and after every change to the source code. This will help to detect many bugs during the development stage of the software.
- Integration Testing
    - Most of the time modules are developed by different developers or the same developer develop modules separately. When those modules are combined to

work together, it is needed to check and confirm those are working as expected. Interaction between combined software modules and hardware will be tested under the integration testing. Integrations testing can be process under black box and white box approach.

- System Testing

  System testing performing on the entire system by deploying software under the different environments, to check the software achieved the requirement specification document.

- Acceptance Testing

  This testing is done by users (customers) after delivering the system to ensure the product meets the requirement and work as user expected.

5.3.3 Test Cases and Plan

"A test case is a documentation which specifies input values, expected output and the preconditions for executing the test." [17] [18] [19] [20]

A test case includes:

- Test data
- Procedures/inputs
- Scenarios
- Descriptions
- Testing environment
- Expected results
- Actual results

"A test plan is a document describing the scope, approach, objectives, resources, and schedule of a software testing effort." [17] [18] [19] [20]

A test plan includes:

- Scope of the project
- Objectives

- Target market
- Assumptions
- Testing cycle start/end dates
- Major roles and responsibilities/overall resources
- Testing environment
- Deliverables
- Major risks and how to handle these risks
- Defect reporting and mitigation
- Testing end date

5.3.4 Test Cases

Common Functionalities for all users				
Test case ID	Functionality	Procedure	Expected Output	Priority
1	Invalid login	Enter user name & password	Redirect to login page and display error message	High
2	Valid login	Enter user name & password	Redirect to control panel of the system. And enable featured options to each user categories	High
3	Unauthorized access to a page with logged user	Accessing a page which restricted to authorized users	User will redirect to control panel	High
4	Unauthorized access to a page without login	Accessing a page without login	Redirect to login page	High
5	Logout	Click on logout link	User will logout & redirect to login page	High

Table 5.2 : test case for login

5.4 Evaluating

Evaluating There exist multiple methods of evaluating usability depending on available resources (time facilities and labor), evaluator experience, ability and preference, and the stage of development of the tool under review. In broad terms it is worth making the following distinctions between evaluation methods: [21] [22] [23]

Evaluating Methods

1. User-based: where a sample of the intended users try to use the application

2. Expert-based: where an HCI (Human-computer interaction) or usability expert makes an assessment of the application

3. Model-based: where an HCI (Human-computer interaction) expert employs formal methods to predict one or more criteria of user performance

5.4.1 Comparisons of Methods

Method	Advantages	Disadvantages
User-based	□ Most realistic estimate of usability □ Can give clear record of key problems	□ Time consuming □ Costly for large sample of users □ Requires prototype to occur
Expert based	□ Low-cost □ Fast	□ Expert variability unduly affects outcome □ May overestimate true number of problems
Model based	□ Provides rigorous estimate of usability criterion □ Can be performed on interface specification	□ Measures only one component of usability □ Limited task applicability

Table 5.3 : Evaluation method comparison

5.4.2 Evaluating System

Via evaluating, can generate benefit of the most reliable and valid estimate of a software usability. We can do it via asking questionnaire/ interview from swatch of users. Evaluating software with sample of users performing tasks is considered to yield the most reliable and valid estimate of a software usability. Questionnaire used to evaluate the software is attached in Appendix A and Appendix B.

The questionnaire was given to users to gather information regarding their understanding of the developed software. Ten properties of the developed system were evaluated in the questionnaire.

According to investigate below chart (in Figure 5.2) show about "Overall view" of the system. We used some questionnaire [Appendix A] for people and get percentage.

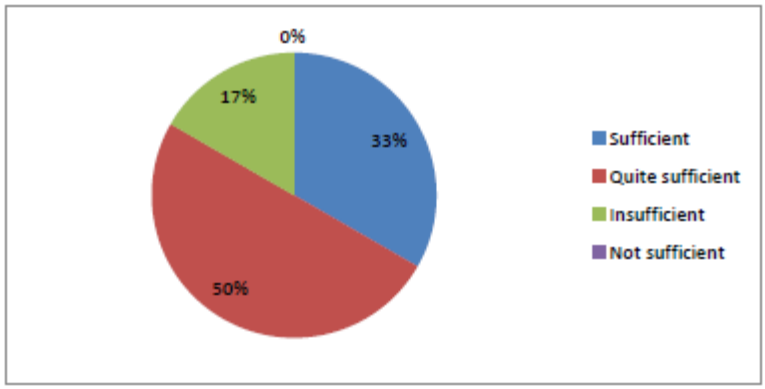

Figure 5.2 : Overall view

According to investigate below chart (in Figure 5.3) show about “User friendliness” of the system. We used some questionnaire [Appendix B] for people and get percentage.

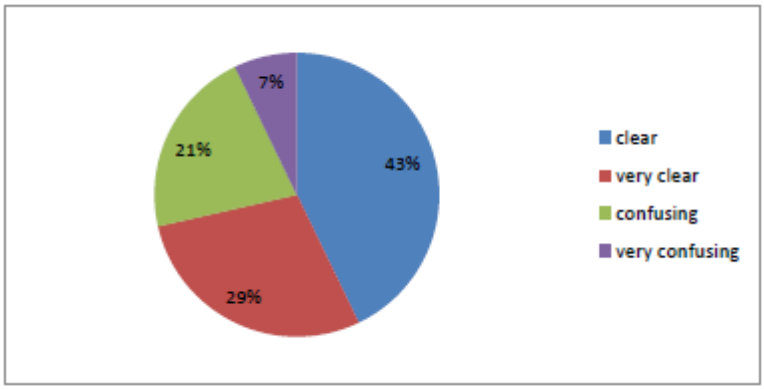

Figure 5.3 : User friendliness

CHAPTER 6

CONCLUSION & FUTURE WORK

6.1 Introduction

This chapter will explains the reflection of author on this software including a critical appraisal on the success.

6.2 Conclusion

6.2.1 Purpose of Project

Yawl race, Marathon race and Bicycle race Monitoring System is begin implementing according to the project proposal. For the module have implemented at the moment don't have any changes. In future there will be some new requirements. Because of Rational Unified Process requirement changes will be easy.

So project is implemented in proposed direction at the moment.

6.2.2. Challenges

At the beginning We have faced few difficulties while gathering requirements. Because we are not directly gathered data. We do it via a partner. So had to spend more time with them to get clear idea about those explanations. But the time spent for those explanations were usefull and time plan did not exceeded. And also there were problems with meeting client because of their busy schedules.(we contacted our partners, they interacted with the clients) Other than those problems we have face time management problems when making reports for implementations. Anyhow achieved the scheduled time of the project.

6.2.3. Lessons Learned

- Gained a good experience in analyzing requirement and design.
- Time management when implementing system.
- Import data and some table structure from existing database structure.
- How to deal with stakeholders.
- Configuring IIS.

6.2.4. Future Works

System have some works to do look as below,

- Fine tune the developed modules and improve the speed of the system.
- New requirement came on client. Because this is online solution and new one. So client me be new wants different wanted at the run time.
- Want to develop suitable login.

- Want to develop/improve reports.
- Improve validation error messages on the system.

6.3 Time plan

There were time exceeded on some planed task. But Flow of the project is begin smoothly with the plan.

6.4 Scope of the project

Scope of the project did not changed and it is reasonable because given time period is enough to complete the project tasks step by step.

6.5 Time allocation for dissertation

Dissertation writing is being continued parallel with implementation. Otherwise if consider about dissertation writing at the end of the project will risk of miss important point which should include in dissertation ant it will be change.

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APPENDICES

Appendix A – User Evaluation Questionnaire

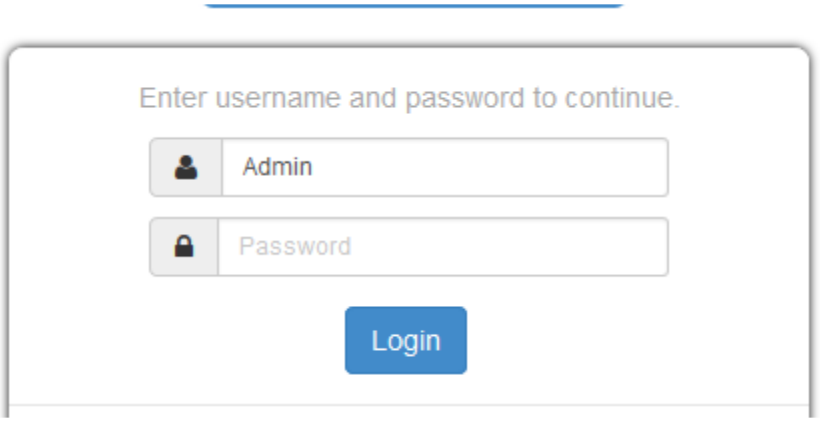
			0	1	2	3	4	5	6	7	8	9	10	
1.	Overall, I am satisfied with how easy it is to use this system	strongly disagree												strongly agree
2.	It was simple to use this system	strongly disagree												strongly agree
3.	I can effectively complete my work using this system	strongly disagree												strongly agree
4.	I am able to complete my work quickly using this system	strongly disagree												strongly agree
5.	I am able to efficiently complete my work using this system	strongly disagree												strongly agree
6.	I feel comfortable using this system	strongly disagree												strongly agree
7.	It was easy to learn to use this system	strongly disagree												strongly agree
8.	I believe I became productive quickly using this system	strongly disagree												strongly agree
9.	The system gives error messages that clearly tell me how to fix problems	strongly disagree												strongly agree
10.	Whenever I make a mistake using the system, I recover easily and quickly	strongly disagree												strongly agree
11.	The information (such as online help, on-screen messages, and other documentation) provided with this system is clear	strongly disagree												strongly agree
12.	It is easy to find the information I needed	strongly disagree												strongly agree
13.	The information provided for the system is easy to understand	strongly disagree												strongly agree
14.	The information is effective in helping me complete the tasks and scenarios	strongly disagree												strongly agree
15.	The organization of information on the system screens is clear	strongly disagree												strongly agree
16.	The interface of this system is pleasant	strongly disagree												strongly agree
17.	I like using the interface of this system	strongly disagree												strongly agree
18.	This system has all the functions and capabilities I expect it to have	strongly disagree												strongly agree
19.	Overall, I am satisfied with this system	strongly disagree												strongly agree

Appendix B – User Evaluation Questionnaire

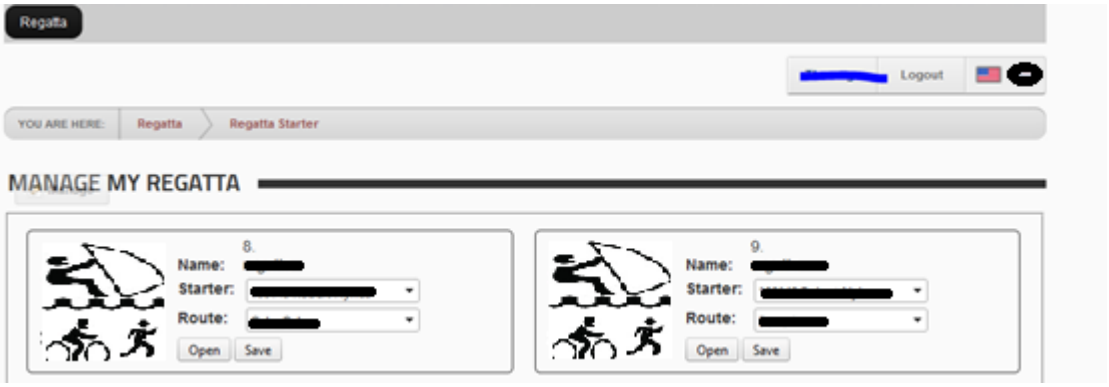
EASE OF USE			**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
1.	It is easy to use.	strongly disagree												strongly agree
2.	It is simple to use.	strongly disagree												strongly agree
3.	It is user friendly.	strongly disagree												strongly agree
4.	It requires the fewest steps possible to accomplish what I want to do with it.	strongly disagree												strongly agree
5.	It is flexible.	strongly disagree												strongly agree
6.	Using it is effortless.	strongly disagree												strongly agree
7.	I can use it without written instructions.	strongly disagree												strongly agree
8.	I don't notice any inconsistencies as I use it.	strongly disagree												strongly agree
9.	Both occasional and regular users would like it.	strongly disagree												strongly agree
10.	I can recover from mistakes quickly and easily.	strongly disagree												strongly agree
11.	I can use it successfully every time.	strongly disagree												strongly agree

Appendix C – Some of user interfaces

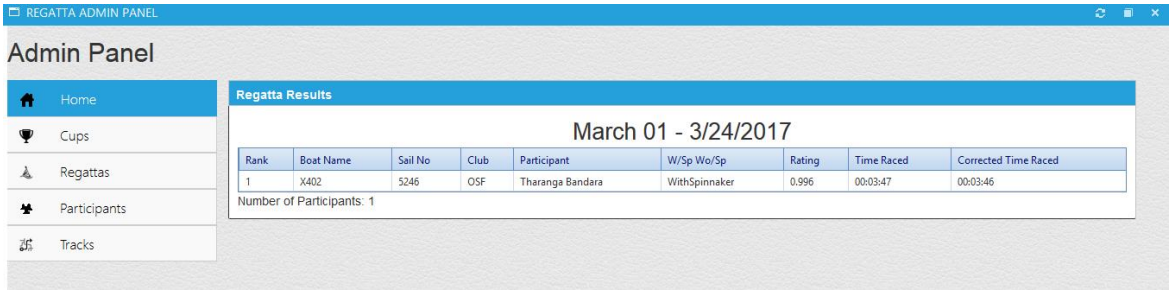
Login

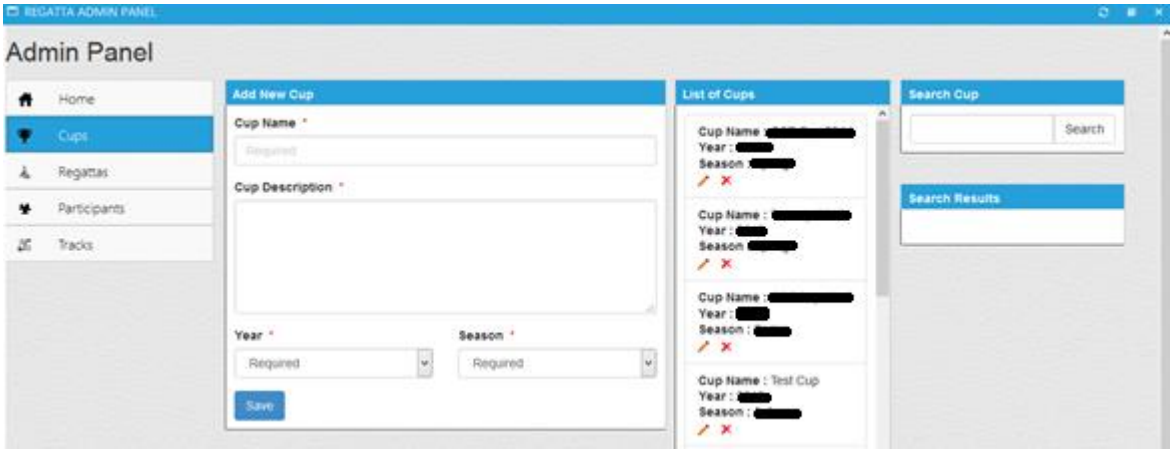


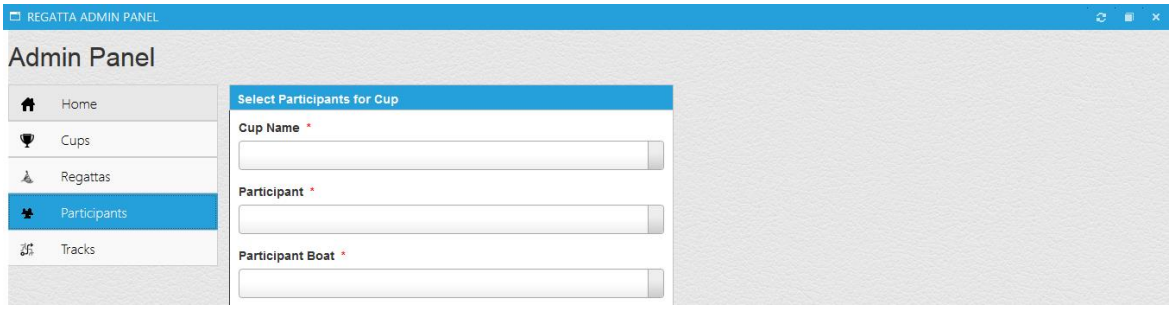
Main page/Home



Admin panal

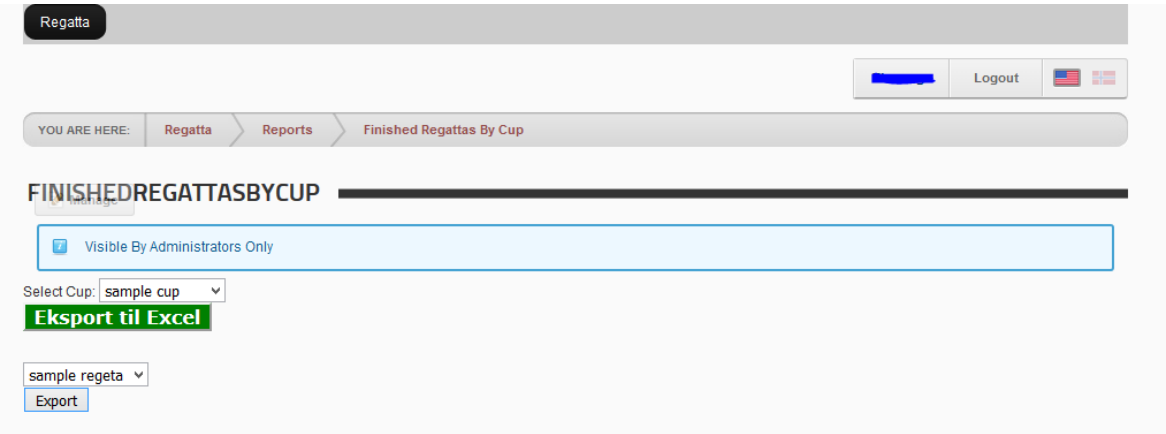


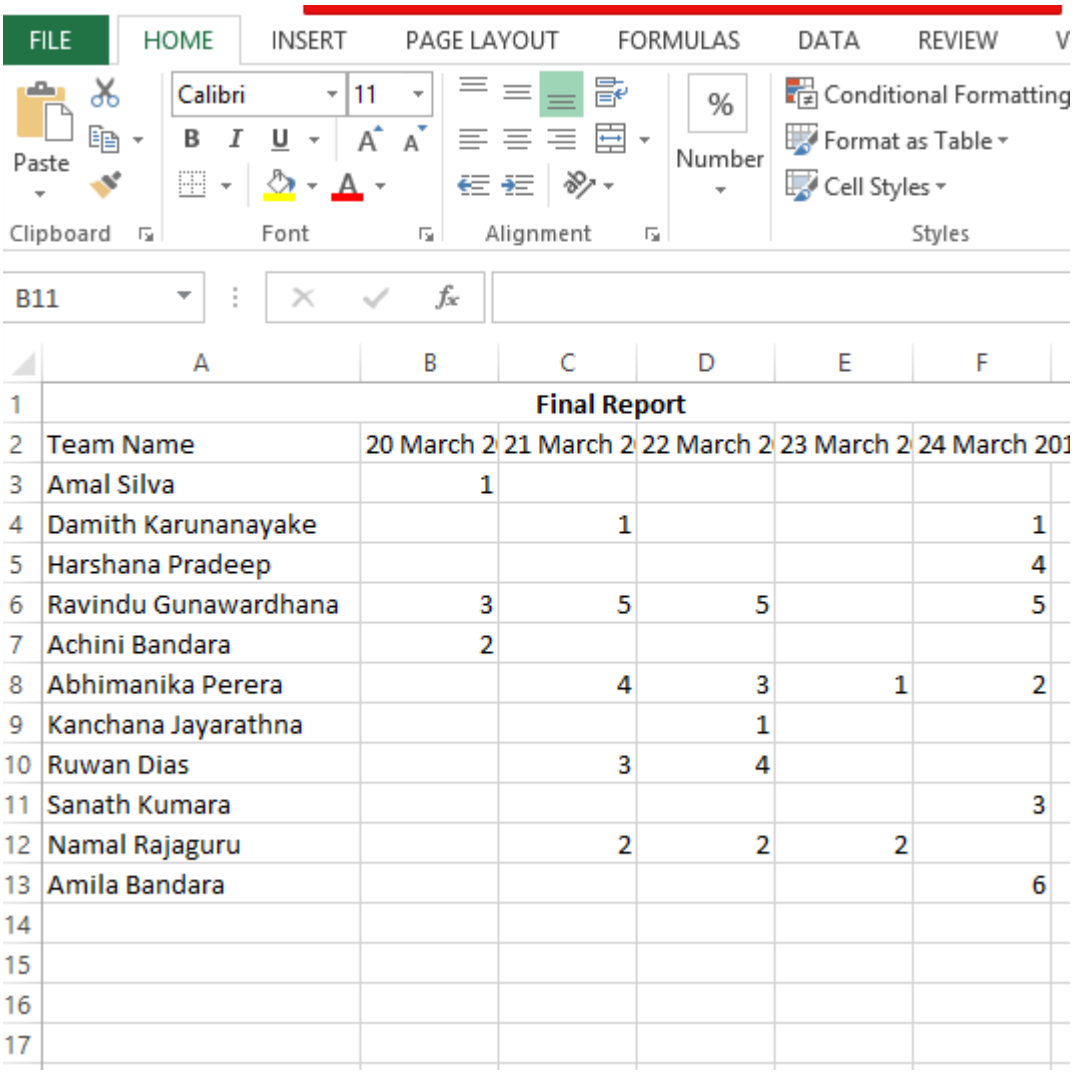




Map View

Report





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	A	B	C	D	E	F
1			Final Report			
2	Team Name	20 March 2	21 March 2	22 March 2	23 March 2	24 March 201
3	Amal Silva	1				
4	Damith Karunanayake		1			1
5	Harshana Pradeep					4
6	Ravindu Gunawardhana	3	5	5		5
7	Achini Bandara	2				
8	Abhimanika Perera		4	3	1	2
9	Kanchana Jayarathna			1		
10	Ruwan Dias		3	4		
11	Sanath Kumara					3
12	Namal Rajaguru		2	2	2	
13	Amila Bandara					6
14						
15						
16						
17						