A CROSS PLATFORM MOBILE WEB APPLICATION

MOBILE BUS TIMETABLE

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This report is submitted in partial fulfilment of the requirement for the degree of MSc (Eng) in [Advanced Software Engineering]

Signed Declaration

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SEPTEMBER 2012

ABSTRACT

This Project, Mobile Bus Timetable is a mobile web application which runs on a Browser Based Internet platform in mobile devices such as Smartphone, iPhone, Android, an iPad or tablet computers either connected through the mobile network or a Wi-Fi connection.

The report mainly concentrates on designing a cross platform mobile web application which can be accessed by the public for their comfort. The bus is a daily means of transport for most of the people for accessing their daily routines, to make their journey little bit easy and convenience, the details of the Sheffield City Buses are considered for the project by getting the details about the routes and timings.

The Project focuses on two major parts one is by Online Survey taken by the Sheffield localities about the additional improvements of the bus services and the second part is the designing and building of a mobile web application according to some of the feedback/suggestions provided in Survey results. The design and building methods are of the application is clearly stated in the report.

The report details a literature reviews, survey methods and its results, requirements and analysis of the system, design and implementation methodologies, testing functionalities along with the conclusion and future enhancements related to the project.

ACKNOWLEDGEMENT

Firstly, I would like to thank my supervisor Dr. Simon Tucker for his constant support and help throughout the project. His ideas and suggestions helped me a lot in designing and developing the project successfully. His guidance and moral support was available at any time till the entire completion of the project.

I would like to thank and dedicate the project to my beloved parents who have been a source of inspiration in supporting me in my life. It is because of their encouragement this became possible.

Lastly, I like to thank the University Of Sheffield and the Department of Computer Science that shaped my career and enrich my knowledge during the course of study

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CHAPTER 1

INTRODUCTION

Mobile devices such as Smartphone, featured phones, iPads or Android based tablets have become most important and popular in our daily routine. Mobile devices are portable and they are comfortable when accessing the information on-the-go as per the services provided by the network or through wireless connections. The people are interested in accepting these technologies for their comfort in accessing the information

During the earlier years web based contents are accessed only by the means of the desktops and laptops with the help of web browsers but as the advancement in technologies and improvement in software tools and applications made the entire world of information to be placed in the mobile devices using mobile web browsers. The Mobile web browser display the same content of the website are displayed in the mobile devices according to the Mobile Operating System but still the browser supports zooming options, keyboard shortcuts and rich text enabled features. The generalised web content has changed the path to Cross platform mobile web applications that are designed and developed for all the mobile devices irrespective of the Operating Systems used in the mobile devices. It provides the advance usage features, functionalities and user friendly interactions.

The main aim of the project is to design and develop a mobile based web application Bus Timetable that can be accessed in all the mobile devices irrespective of their features, operating systems and options, which ultimately help the people in accessing the content “Anytime-Anywhere”. Mobile Bus Timetable application developers mainly focus on developing a user-friendly application that can be used to access the stops, timings and routes of the bus services in the city for the people according to their ways and means.

The Project is divided into two stages; the first stage regards a survey that was conducted among the people residing in Sheffield, United Kingdom by considering about the means of transportation, the services provided by the bus company, their satisfaction level about the bus services and their feedback regarding the improvements and additional features that are to be added. The second stage is the design and development of the mobile web application for cross-platform mobile devices. The application’s main objective is to provide the user with the major information in accessing the timetable about the routes, stops and timings of the bus services as per the analysis of the user’s response through the survey

There are many web based technologies are used in developing the website, Open Source Content Management Software such as Drupal, Joomla, Wordpress etc... Are also used for developing the website. .Net technologies are also used for designing a developing rich content web sites, all these technologies have advantages and disadvantages by analysing various methods that are briefly described in the subsequent chapters. The Survey website is designed using PHP along with MySql The development of the mobile web application for the cross platform mobile devices mainly uses HTML 5 and jQuery supported frameworks. The most important frameworks that are considered for the designing and development of the mobile web application are listed in a website named creativefan [1]. The analysis of the framework

gave an idea to consider jQuery mobile framework for the design and development of the entire application.

The report consists of eight major chapters as follows chapter 2 discuss the Literature review for the mobile bus timetable the current system and the proposed system, the mobile web development methods, the framework and the languages are also discussed in the section. Chapter 3 discuss the requirements and analysis of the system, the section also has the chart analysis of the survey. The requirements are studied for the mobile development. Chapter 4 discuss the System design, the architecture of the system and discussion of Mobile development Life cycle. Chapter 5 explains in detail about the mobile app development and the screenshots of all the pages through a simulator. Chapter 6 deals with the testing part of the application with the testing process and testing tools. The Future enhancement and improvements are discussed in Chapter 7 and the conclusion part is dealt in Chapter 8. Thus the whole of the report is explained briefly with the introduction part

CHAPTER 2

LITERATURE REVIEW

2.1 Mobile Web Application:

Web Applications are software applications that are written in a browser supported language such a JavaScript and HTML which is then executed in a common web browser. As the internet gained its popularity among the users the web has got its exposure among the internet and computer users. In earlier days web was related as static document which has a single page, the sequence of pages was framed through markup language. In later stage the dynamic elements are added in the web pages using JavaScript with the addition of XML and AJAX also came to existence for modifying the entire web into web application with the dynamic contents. Web Application in general is defined as "A web application is an application utilizing web and web browser technologies to accomplish one or more tasks over a network, typically through a web browser" [2].

The project concentrates on developing a mobile based web application, which is defined as internet enabled web application that have cross platform functionality and can be accessed through the mobile browsers without downloading or installing the apps in the device. According to the whitepaper published by IBM "Mobile devices consists of powerful browsers that support HTML 5, CSS 3 and advanced JavaScript. HTML 5 technologies is exclusively for the mobile web development for a rich browser enabled application [3]. The major advantage of mobile web app is its multi-platform support and the cost of development is low [3].

Mobile applications are generally categorized into four different types such as Native apps, Hybrid apps, dedicated web app and Generic mobile app which are discussed in the chapters below. The Native apps are the application that is designed with a specific programming language such as objective C for iOS, Java for Android. Hybrid apps rely on a specific framework for their development but they have cross platform functionality and can be used in all Smartphone. Dedicated web app is a mobile based web site that is designed towards specific mobile devices. Generic mobile web app is the application that is designed for every web enabled mobile phones [4].

2.1.2 Mobile Bus Timetable:

Bus is considered as the convenient source of travel for the people around the world. As the advancement in the mobile technology there are many articles, papers and resources related to the bus transportations are considered. In the year 2008 Transportation Research Information Services by the UK government reported a number of virtual dissemination media including mobile media. In the same year 25 Local authorities currently use an in 2008; approximately 25 local authorities [LAs] currently use a form of virtual dissemination to make RTPI [real time passenger information] available to the public. The technology that are facilitated in real time information is

trip-planning software, the real time information are provided by the mobile devices called transit system, demonstrated in San Francisco bay area:

"It combines a user's geographic location with real-time transit information provided by transit agencies to determine the fastest route to a desired destination. It fuses real-time data feeds with the existing technology of schedule-based transit trip planners (TTPs) currently available online. . . . The system predicts the shortest paths between any two points in the transit network using real-time information provided by a third party bus arrival prediction system, relying on GPS [global positioning system] equipped transit vehicles. Users submit their origin and destination through a map-based iPhone application or through a JavaScript enabled web browser. A server implementing a dynamic K-shortest paths algorithm with predicted link travel times returns personalized route directions for the user, displayed on a map. The results show that routing using the predicted bus arrivals marginally increases the accuracy of the total travel time and the optimality of the route" [5].

The another mobile trip planning application is SCOTTY Mobil application it is mobile route planner that provides timetable information, route maps and real time information about the journey, the application is designed as an application for native apps for iOS and Android devices[5][6]. Another mobile travel planning application using real time information developed for Verkehrsverbund Berlin–Brandenburg (VBB), which is the public transport authority of the Berlin–Brandenburg in Germany. VBB's traveller information system that provides the information for the Internet and mobile devices users [5].

Most of the transportation applications are designed and developed as native app exclusively for iPhone, Android, Blackberry etc. Traveline Cymru's is a free native app for iPhone and Android, that provides information about planning the journey, travel alerts, finding the bus stops, searching for community transport[9]

2.1.3 Current Bus Timetable System

Timetable provides most important information for the passenger travelling either in bus, tram or train, but as the technology advances the methodology is also changed according to the user's requirements. Mobile Technology changed the face of the whole world all printed information is converted to mobile devices as native applications, hybrid application or generic application. During the past the user has to get the information about the timings and route services of the bus with the help of printed timetable at the stopping or getting the information from the travel desk, this method has changed when the era moved to internet technology where all the information are published in the website, all the bus service company designed a website with all the information mainly with the timetable and the route services.

This services where very popular as the user got the timetable either in the laptop or pc by sitting either in their home or office, this has changed into more advance services as by booking the tickets, finding the routes and directions for a particular place, but there was a little disadvantage which is the web applications cannot be made portable as it can be viewed with the help of web browsers, these browsers are not compatible for mobile devices, hence the timetable and other details are made available for the user having their pc or laptops with internet or Wi-Fi connection.

At present mobile devices has made another revolution with the smart phones, tablet and PDAs. I phones, Android, Blackberry and windows based mobiles and tablets have its own programming languages for designing and developing the native application, these mobile phones and tablets also support a mobile browser as equivalent to the web browsers in the pc, There are numerous native application for the bus timetable are designed for the mobile users where each and every applications have its requirements and specifications. When compared to mobile native application, mobile web applications for cross platform devices are very minimum, hence the current bus timetable with the service information is designed for the native mobile applications.

2.1.4 Advantages of Cross-Platform Mobile Application

Mobile development for cross platform supports HTML, CSS and JavaScript**.** These cross platform application have excellent features for the smart phones with the help of JavaScript API; these API has many mobile phone functionalities such as Camera, Accelerometer, Contacts, Database, and file system [10]. The cross platform applications are designed using HTML5, Jquery and JavaScript. The key advantage of mobile web applications is [11]

- Create fast and easy mobile apps using HTML, CSS, and JavaScript
- Cross platform compatibility
- Application accessing via URL
- Supports major mobile platforms including Android, iPhone, BlackBerry and Windows mobile
- Improves Productivity.

2.1.5 Comparison of Native vs. Hybrid vs. mobile web application

The different mobile applications are compared as [12]

	Native app	Hybrid app	Mobile web app
Tools needed	Objective C Java C++ C# VB.net	HTML CSS JavaScript Mobile development framework	HTML5 CSS JavaScript
Published and distributed	Appstore/Android Market	Appstore/Android Market	Internet
Speed of development	Slow	Moderate	Fast
Application maintenance	Difficult	Moderate	Low
Device Access	Full access(to camera,microphone,upload file etc)	Full access(to camera,microphone,upload file etc)	Partial access(GPS,accelerometer)
Offline Access	Yes	Yes	Yes
Advantage	Creates apps with rich user interface	Combines development speed of mobile web app with device access	Fast development, simple maintenance, application prortability,cross platform
Disadvantage	Development time,cost,maintenance,non-portablitiy	Cannot handle rich user interface and graphics	Cannot handle rich user interface and graphics Cannot access camera or microphone
Best for	Games, Consumer focused apps with etc... high graphics	Consumer and business app with less graphics and user interactions	Consumer and business app with less graphics and user interactions

Table 1 Comparison of Native vs. Hybrid Vs mobile web application

2.2 Frameworks and Languages for Cross platform mobile web application

The mobile web application for cross platform devices can be designed and developed with the support of mobile frameworks such as Sencha Touch, Jquery mobile, DHTML touch etc...A framework is the layered approach that interrelates with the Operating system and communicates with the subsystem. The main language that supports the mobile application is HTML5, CSS, Jquery and JavaScript. Mobile web application framework makes the design and development easier, that meets the difference screen for each devices and different user experience. The mobile frameworks that are listed are for developing the mobile web application.

2.1.2 Mobile Languages

The languages are the most important aspect in executing the application as per the requirements of the user with the help of the framework. The appli-

cations are divided as native apps, hybrid apps and mobile web app the language used for these applications are irrespective of the platform, certain languages that are used are objective c for iphone, Java – Android SDK for Android mobiles and Tablets, Java Blackberry for Blackberry mobile and Windows mobile programming for Windows mobile these mentioned programming languages are used for the native mobile application. The languages that are used for cross platform mobile web application are HTML5, CSS, JavaScript, and Jquery that run on mobile browser.

2.1.2.1 HTML 5

HTML 5 is a mark-up language for structuring and presenting content for the World-Wide Web specifically used for mobile web applications for the cross platform devices. The history of HTML development was published by World Wide Web consortium in the year 1997 as HTML 4. HTML was extended to XML later became XHTML1.0. In the year 2003 XHTML extended as XHTML extended form. The web forms of XHTML are converted to the final part as HTML 5that are compatible for all mobile devices for mobile browsers.

2.1.2.2 What's New in HTML5?

- HTML 5 easy to implement.
- HTML 5 uses UTF-8 for defining with one meta tag
- Separate tags are created in HTML5 to support the elements of the page
- HTML 5 has a new Inline elements such as

HTML 5 supports a dynamic HTML page that is simple by adding context menu that can be placed as the script in the web application rather than using href tag.

- HTML 5 supports form types similar to HTML 4, with some additional new input types such as date, time, month, week, number, range, email, url etc..
- The new elements that are added in HTML5 are canvas, video and audio.

2.1.2.3 Features of HTML 5

The features of HTML 5 are related to

- offline applications
- local storage
- connectivity
- file access methods
- web audio and video using audio/video tag
- 2D/3D Graphics is supported
- presentation by creating rich and beautiful sites with CSS3

2.1.2.4 Advantages of HTML5

HTML 5 has many new features that includes <video>, <audio> and <canvas> as well as integration of SVG content. The main advantage is that it is very easy to integrate multimedia and graphical content to web without using third party plug-in. The other advantages are [16].

Mutuality:

Embedding of video, audio, graphics, drawings and animation without any third party plug-in and supports the browser of all categories and devices.

Consistency:

HTML 5 has got good coding methods and easy to understand with the elements that has more consistent in coding**.**

Accessibility:

All types of browsers with different technologies that uses HTM L5 makes more detailed understanding in the structure of the page.

Offline Applications:

Offline browsing is supported by HTML5 which provides a cache applications such as the file (or) page can be viewed during offline browsing.

Client-side database:

HTML 5 provides two storage methods one is of session storage and the other is the local storage, it is not a permanent storage but store the data temporarily as to reduce the cookies size.

Geolocation:

The most important advantage of HTML5 is the use of geolocation, with this feature anyone can find the current location and sharing the information among the people and is supported on all HTML 5 supported devices.

2.3 INTRODUCTION TO CSS

Cascading style sheets (css) control the elements by formatting on the Web pages. CSS is designed to control the structure of web pages such as heading, images, links, table else controls these elements following the HTML commands. Styles are like protocol that decides how the elements appear in a web page with font style and colour. Browsers that support CSS have a built in Cascading order of importance as [18]

- Undefined Styles
- Inline Styles
- Embedded Styles
- Linked Styles
- Imported Styles
- Default Browser Style

2.3.1 CSS 3

Cascading Style sheet level 3 also defined as CSS 3, it is a recent approach of style sheet. The popularity of cascading style sheet 3 is that it gives greater flexibility. This modularized capability can develop and maintain the system very easily

2.3.2 Benefits of CSS 3

The benefits of CSS 3 are [19]

Faster completion Time:

As the whole web page is divided into many modules, these modules are finished and checked making the completion time faster.

Flexibility:

Individual modules are updated and changed which is tested and then integrating makes the system maintenance very simple.

Accessibility:

The styles can be separated from the content which makes the user to differentiate the content of a web page, or modify the content.

Consistency:

The Layout and the position of the styles are consistent for the whole website.

Compactness:

The CSS style is removed from the HTML as the HTML page is smaller in size, and CSS is used separately externally from the HTML page. These CSS can be downloaded and it can be used on different web pages.

2.4 PHP:

PHP **H**ypertext **P**re-processor is an Open Source HTML – embedded scripting language. It is a server side scripting language. Supports databases such as MySql, Oracle, PostgreSQL, Generic etc...PHP is platform independent and supports all servers.

Features [28]**:**

There are some features supported they are

- Lesser time is required and it is faster in access.
- Easy to develop complex websites.
- Free online tools are supported.

Advantages [29]**:**

- PHP is Open source software that is free to download.
- Easier syntax and better understandings
- Easy interface with mysql.
- Platform independent – easier to download PHP hot scripts.
- Accessing web tools are easier in PHP.

2.5 jQuery:

JQuery is a lightweight JavaScript function that is designed for the simplification of client side validation of HTML.It supports mutibrowser, free open source library of JavaScript function. The syntax of jQuery is easier to navigate the document, handle events, and create animations, usage of AJAX applications. jQuery creates plug-ins that is used in the JavaScript library [20].

2.5.1 Features of jQuery:

jQuery has some important features they are [21]

DOM Elements:

jQuery provides the capability in selecting the DOM elements. jQuery also supports CSS 3 to select one or more elements.

Events:

jQuery provides simplified event handling. Events can be easily bind and unbind as the specified functions.

Cross Browser Support:

jQuery supports browser that makes it very easy to handle events in different browser.

AJAX support:

AJAX stands for Asynchronous JavaScript and XML. AJAX can be used to connect the database. jQuery have an effective AJAX methods library to extend the functionality.

Language Compatibility:

jQuery supports all web language. Some of the frequently used language with jquery is PHP, ASP, JSP, Servelt, and CGI.

2.6 Mobile Framework:

Mobile development has a rapid growth after the introduction of Apple iphone and Android smart phones. The mobile browser has been robust by using

HTML 5, CSS 3. There are few frameworks that are aimed for creating a mobile web app rapidly. The UO framework for the mobile web app are listed as [22]

2.6.1 jQuery Mobile:

jQuery mobile is the user friendly UI for the mobile. It has a widget library that converts semantic mark up into user friendly format. It is built on the top of jQuery. The jQuery mobile supports a large number of mobile browser platforms [22].

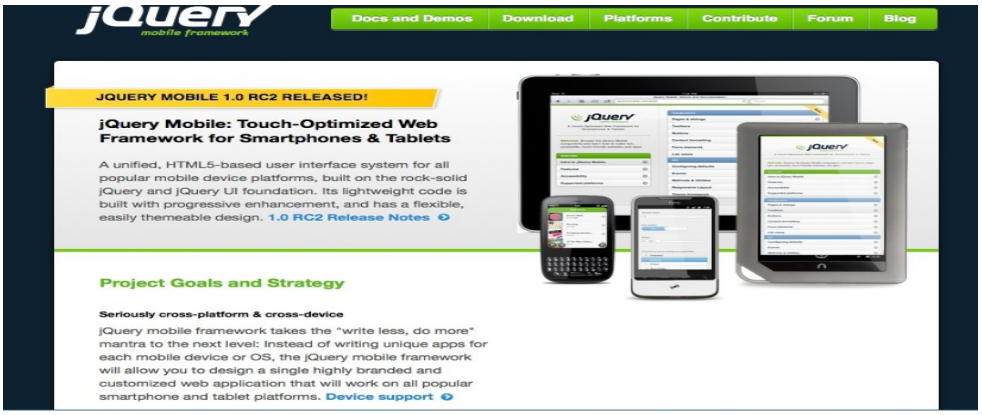


Figure 1 jQuery Mobile Framework

2.6.2 jQTouch :

JQTouch is similar to jQuery mobile but jQTouch has got a slighter difference where jQTouch is targeted to small webkit browsers on small screen devices which explain that jQuery Touch uses web kit features to deliver a higher level with less code.jQTouch is a simple free open source jQuery plug-in with animations, navigations, themes for mobile webkits [22].

Figure 2 jQTouch Mobile Framework

2.6.3 Sencha Touch:

Sencha Touch is another mobile framework with full features widget library based on EX JS JavaScript. The Sencha Touch also has the similar methods like jQuery mobile, but the apps developed in Sencha Touch can automatically recongonize according to the tablet devices. It is not a mark up type of language. Sencha Touch is powerful since the JavaScript code is in client side MVC [22].

Figure 3 Sencha Touch Mobile Framework

2.6.4 Sprout Core:

Sprout Core is an Open Source JavaScript framework that was created for developing web application for desktop browsers. The Sprout core is too large to support for mobile development, it allows the developer to create a high end web applications with advanced capabilities and user experience when compared to desktop applications [22]

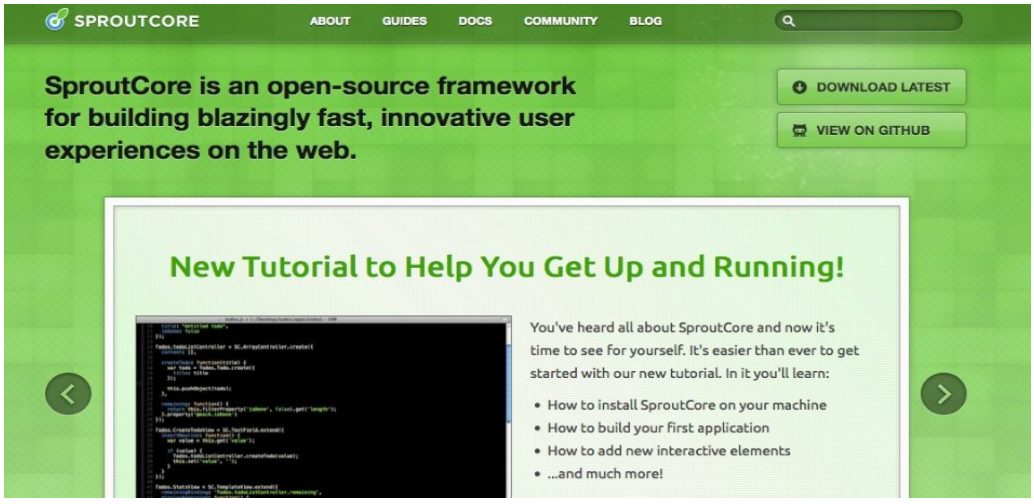


Figure 4 Sprout Core Mobile Framework

2.7 Common Features of Mobile Framework:

The common features of mobile frameworks for the deployment of mobile web app are [23]

Optimization:

The mobile framework should support a UI element and event handling methods as the mobile devices majorly support fingers as the input devices.

Cross Platform:

These mobile frameworks supports multiple mobile device platform either iOS, Android, Blackberry etc…

Lightweight:

Due to the bandwidth limitations the web development applications uses a light weight file size placed on the web development frameworks.

HTML5 and CSS3

Most of the mobile devices have a web browser that supports HTML5 and CSS3 which takes the advantage of developing new features available for better user experience.

2.8 jQuery Mobile Framework:

jQuery Mobile is a framework that is used for developing mobile web applications. JQuery mobile is built on the top of jQuery user interface (UI). jQuery mobile framework ensure consistent look, feel and easy access across cross platform mobile devices

2.8.1 Basic Features of jQuery Mobile:

The basic features of jQuery Mobile that made the framework as the best mobile framework for developing the mobile web app rapidly [24].

Simple and Flexible:

- Framework is simple in usage.
- The user can dynamically create the pages using simple mark up language
- Advanced JavaScript events are used for handling the methods.
- Single HTML document are embedded with multiple pages.
- Applications are break up into multiple pages.

Support for Touch devices:

jQuery mobile framework supports both touch and other inputs events according to the user.

Language compatibility:

jQuery mobile supports HTML5, CSS 3 and JavaScript. jQuery mobile is to support both high end and capable devices.

Lightweight:

The overall size of the framework is minified and it is developed in a user interactive manner, as it supports the whole of HTML applications.

Usage of own styles:

jQuery mobile framework uses an own application style to define the themes as specified by the user.

2.8.2 Supporting Devices

jQuery mobile provides support a large number of mobile devices. As the framework is classified into three different categories based on the level [24]

A Grade :

Devices that support for a fully enhanced experience with AJAX-based page transitions. IT supports over 20 different devices such as iOS 3.2-5.0. Android 2.1 – 2.3 and 3.0. Blackberry 6-7 and playbook, Skyfire 4.1.

B Grade:

Devices support without AJAX navigation features. Devices include Blackberry 5.0, Opera mini 5.0, 6.5 and nokia symbian A3.

C Grade:

Devices which support for a basic non-enhanced HTML. The devices supported are older Smartphone, including blackberry, Windows mobile.

2.8.3 Structure of jQuery Mobile:

A typical jQuery mobile page has three sections a header, content and footer sections. A jQuery Mobile site must start with an HTML5 "doctype" to take full advantage of all of the framework's features [25].

```
<!DOCTYPE html>
<html>
<head>
	<title>Page Title</title>

	<meta name="viewport" content="width=device-width, initial-scale=1">

	<link rel="stylesheet" href="http://code.jquery.com/mobile/1.2.0-alpha.1/jquery.mobile-1.2.0-
alpha.1.min.css" />
	<script src="http://code.jquery.com/jquery-1.7.2.min.js"></script>
	<script src="http://code.jquery.com/mobile/1.2.0-alpha.1/jquery.mobile-1.2.0-alpha.1.min.js">
</script>
</head>

<body>
	...content goes here...
</body>
</html>
```

Figure 5 Basic Structure of jQuery Mobile

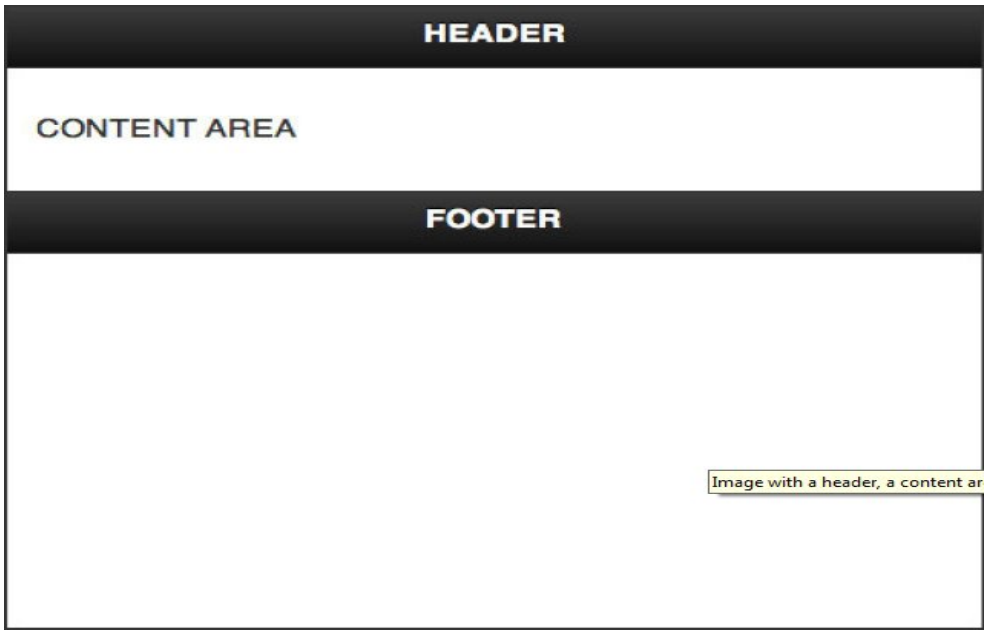


Figure 6 Basic jQuery mobile page

2.8.4 Why jQuery Mobile framework

There are plenty of mobile frameworks for the mobile web app development, the reason for choosing the jQuery mobile framework is that it has been considered for the designing approach as [24]:

Response Time :

Multiple pages are downloaded in a specified time and there are HTML linked pages at different sections are considered to satisfy the users the response time of multiple pages should have slower response time and faster downloading methods hence jQuery mobile is considered.

Error Handling:

There are built in form validation methods and events are used in jQuery mobile framework for the easy access of the user.

Browser and Language Support:

The framework supports two main language HTML5 and jQuery that are compatible to all mobile devices irrespective of the mobile operating systems

2.9 Comparison of Mobile Framework

Mostly the mobile frameworks are broadly classified into two broad categories such as [26]

- Web development framework**:**

Designed by HTML5, CSS, JavaScript and jQuery and implemented using jQTouch, jQuery mobile, phone Gap

- Custom API framework:

Designed by JavaScript by using Sencha Touch.

The frameworks are compared for the better understanding in choosing the mobile framework for the development of mobile web app.

	jQTouch	**jQuery Mobile**	**Sencha Touch**
Developed by	David kaneda	jQuery	David kaneda
Nativeness	Used by iOS	Consistent on all mobile platforms.	Supports all mobile platforms
Cross-browser support	Initially-iphone & ipad.Current updation-Android devices	Android,iOS, Blackberry, Bada,MeeGo,WebOS and Windows phone	Android,iOS, Blackberry

Dependency	jQuery library	jQuery library	Sencha API
Performance	Slow, poor in animation	Average, compared to API framework	Better than jQuery-Touch,jQuery mobile
Ease-of development	Easy to build iphone app	Easy because of UI	Little complex
Language	HTML5,CSS,jQuery	HTML5,CSS,jQuery	Sencha API and JavaScript

Table 2 – Comaprison of Mobile Framework

CHAPTER 3

REQUIREMENTS AND ANALYSIS

This chapter mainly concentrates on the analysis and requirements for the system design and development, as this is the first phase in software development it clearly shows the better understandings for the next stage of development with high end designing.

3.1 Analysis – Survey Website

The development of a new kind of application focuses for mobile devices should be analysed that can satisfy the required requirements. In addition the mobile web application will be used by all kinds of users based in Sheffield, hence the requirements of the system and application should be made clear, as the users are the important aspect in the project each and every part of the design and development of the applications are analysed from the user's view of requirements**.**

As to make the requirements successful a survey was conducted for some valuable suggestions/feedbacks received from the users. The Survey consists of a simple questionnaire about the travel information, journey details and the service provided by the bus companies.

The Survey was taken by 250 respondents, it helped in understanding the satisfactory level of the passengers about the services and information provided by the bus companies gave a good design and development for the mobile web application. The details about the survey are provided in the appendix A.

3.2 Results – Chart Analysis

Survey results are compiled and converted into chart for easy analysis and discussion on the results. The survey questions were mainly focused on the passenger's requirements such as proper bus timings, location access of information via mobile. The survey is analysed by chart analysis that are presented below

The first chart shows the purpose of journey of the passengers, the total respondents are 250 out of which 95(38%) respondents uses the bus services for work, and the second important access is the university out of 250 respondents 90(36%)uses the buses.

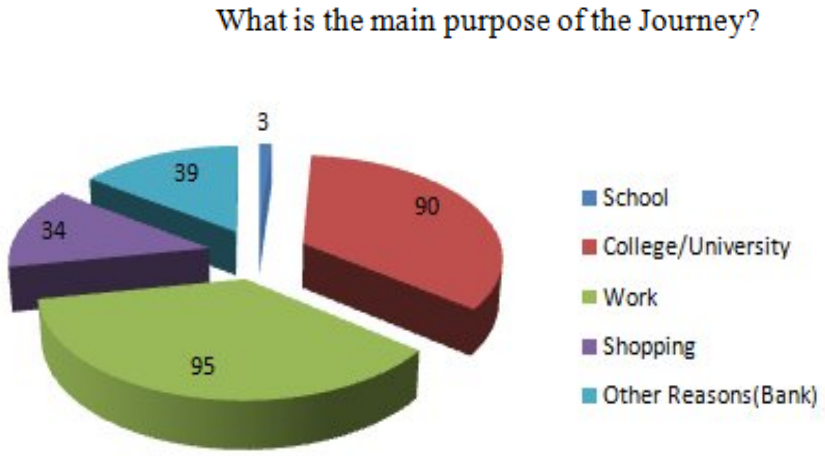


Figure 7 Purpose of Journey

In the next chart, the question was focused on how often does the passenger uses the bus services, the result shows that out of the total 250 respondents 93(38.56%) gave the answer as they use the bus services weekly once/twice as there is a slight difference as the passengers uses the daily bus service was 80(32%). There are passengers who uses the bus services occasionally was about 16%, hence this information has shown a conclusion as most of the passengers uses the bus services the requirements can be analysed as per the feedback of the respondents.

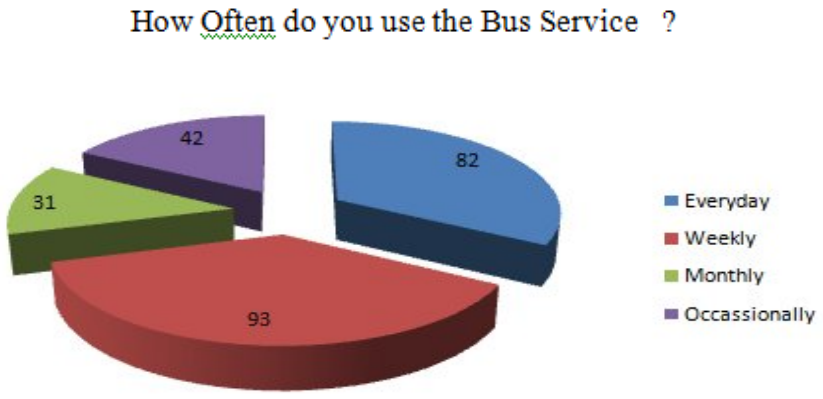


Figure 8 Use of Bus Service

To understand as to why the passengers are using the occasionally, weekly and monthly, a survey question is framed in a particular aspect of buses unreliable, timings, price of tickets and wrong destinations, hence the chart analysis for this question gives the better understanding about the passengers opinion. The most reason for not using the bus services are given by 41 respondents (16%) and the next important reason are given by 26 respondents (10%) as the buses are unreliable and cost also plays an important part for not using the bus.

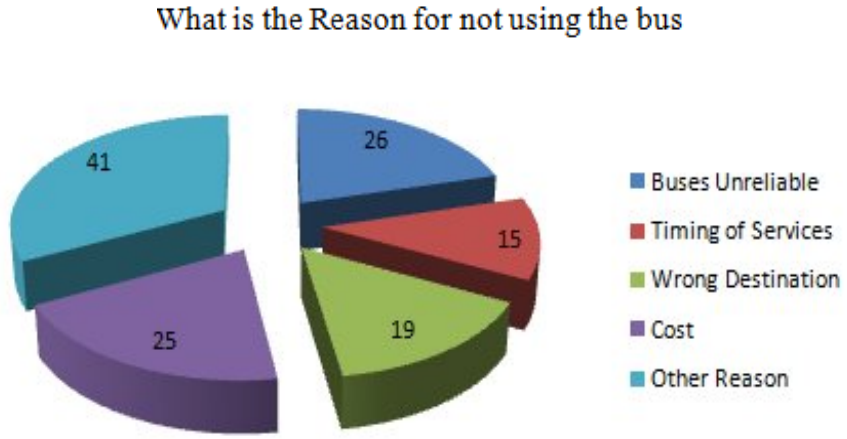


Figure 9 Reasons

Next survey question was related to the information that are provided by the bus companies is made available in a mobile device, currently some bus companies have the process of sending some alerts or push messages about the timings and locations of the bus services, but this is a pay per request type of method available for the passengers. The services provided by the bus companies to access the information anytime, anywhere is responded with the answer yes where from 140 respondents(56%) but the respondents are not satisfied form the services provided by the bus companies hence out of 250 respondents 156 respondents(60%) has given their opinion.

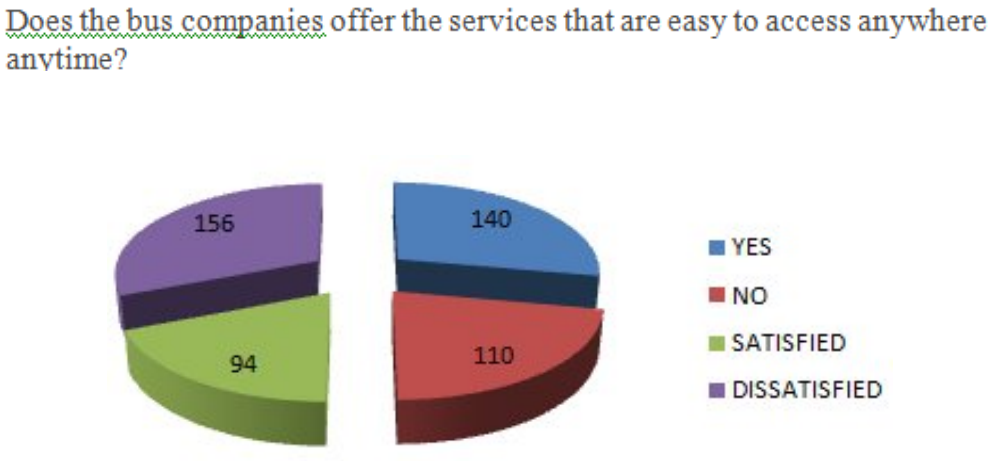


Figure 10 Information Access

The most important kind of question that made the design and development for mobile applications is that in the travel southyorkshire website there are details about

the timings and the location of the bus services are available in the website where out of 250 respondents 196 (75%) of the respondents are satisfied with the details in web-site.

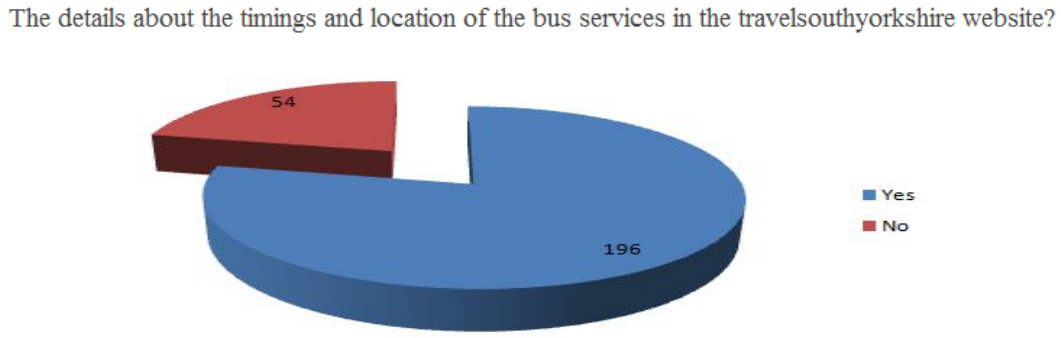


Figure 11 Website Information

The Survey question focused on the important opinion about the source of information that the passengers use when they plan the journey. There are different methods in finding the information such as timings, locations and stopping services from printed timetable at the bus stops, timetable from the websites. From the survey opinion it was analysed that the passengers using the buses generally get the information from the timetable at the bus stops with 33.2% get the information. About 20.4% of the passengers get the sources from the bus website. The 14% of the respondents get the details from the timetable which is in general. So timetable in website and bus stops are the source of the people to plan the journey.

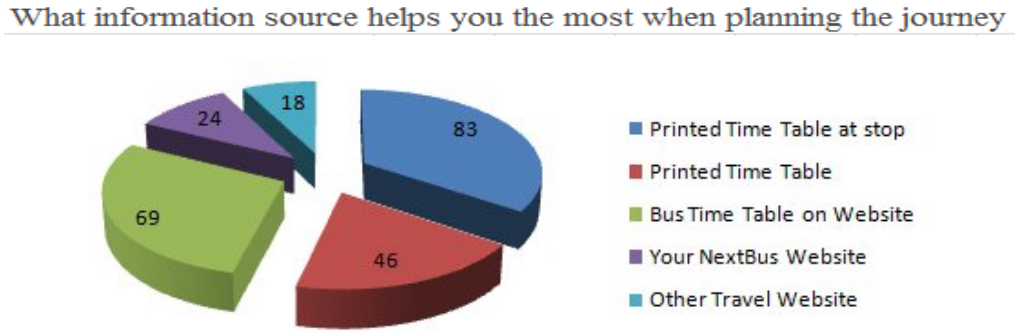


Figure 12 Information for journey planning

The next chart analysis on the information accessed via the mobile devices. Currently the travel website supports the messaging services as per the request of the user, but it is a paid services, certain information are not been used using the mobile devices. As the survey helps in identifying the feedback from the respondents, most of the respondents cannot access from the mobile. 61.6% of the respondents answered no from out of 250 respondents.

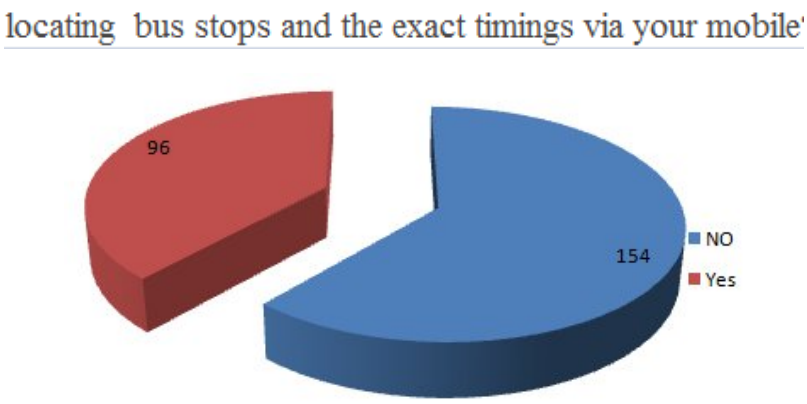


Figure 13 Mobile Services

The overall satisfaction of the information provided in the survey website gave a broader analysis for the next development of the application. The respondents are not satisfied from the information provided by the bus service company where 56% of the respondents are dissatisfied about the bus services. The overall satisfaction is 40%.

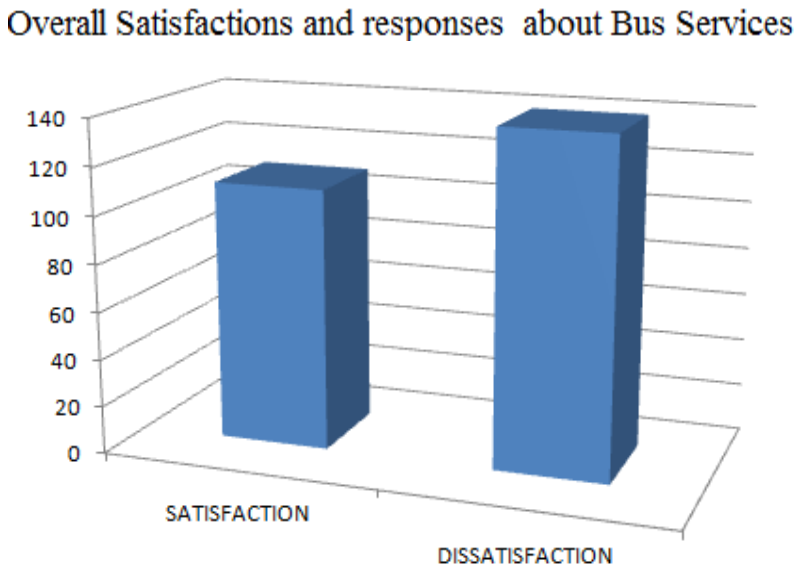


Figure 14 Overall Satisfaction

Hence the results along with the chart analysis gave a better understanding in designing and developing a new mobile application using the requirements received from the survey.

3.3 Requirements:

Requirements in software development are defined as the tasks that meet the conditions for a new developing application. Requirements are defined in detail regarding the sufficient system design. There are two major categories they are Functional requirements and Non-Functional requirements.

3.3.1 Functional Requirements:

This requirement defines a function of the software/application system and its entire components. Functional requirements in a simple method are expresses as what the system is supposed to achieve.

The Survey analysis with the chart format gave a clear understandings of what the users' requirements either it is the website or the mobile devices. As followed by the proposed system the general and basic outline of the mobile web application is that, the web app should be made available on all the platforms of the mobile devices, it should be user friendly and mainly focuses on timings and location of the bus services.

The entire web app is divided into four major modules that are handled by both the system and the user. The functional aspect of the system is that to make the location services, timings are made available to the Smartphone/tablet users.

The modules of the mobile web application are the routes and services, next bus availability, search by routes, popular vists /destination and feedback modules. The source information are analysed and downloaded from the travel southyorkshire website. The next bus and search modules are controlled by the database. All the functional requirements serve a mobile web app in a better manner.

3.3.2 Non-Functional requirements:

Comparing functional and non-functional requirements, non-functional is the important requirements in developing a better application. A functional requirement supports the application modules but a non-functional requirement supports the technical issues of the system, such as the security, quality and features of the system.

Usability:

As per the survey conducted, the respondents mentioned the flaws in the current method of obtaining the source of information from the website and the access of details through mobile. So the application is developed in a better way that makes the user to use the system in an interactive process.

Availability:

Mobile devices are the most popular technology used in the current scenario either Smartphone (or) tablets hence the web app is designed for all types of Operating systems irrespective of their platforms, the major requirements is that the application should be executed in the mobile browser.

Portability:

As the application is executed in the mobile web browser irrespective of the platforms they are made portable to all kinds of mobile devices.

Performance:

Performance is the most important non-functional requirement, which displays how fast the system responds to the user. The input is based on the touch gestures as it is a Smartphone, the system should perform in a better way without any delay.

CHAPTER 4

SYSTEM DESIGN

4.1 Introduction:

System design is the next phase in software development after the careful analysis and better understanding of the requirements of the application has to be developed according to the user's needs. The mobile web application is designed and developed using the mobile framework as chosen carefully after Comparing and considering the advantages jQuery mobile framework is used for the development of this cross platform mobile application

4.2 Architecture:

A key aspect in building cross-platform apps is to develop am an architecture that leads for sharing a cross platforms. This certainly follows Object Oriented programming principles.

Encapsulation:

API performs the required functions and wraps the implementation details. The objects behave as the black boxes. The API controls the entire user interactions easily at the architectural level such that the UI code should be responsible for all the inputs and touch interactions [30].

Separations:

Each and every component both architectural and class are displayed and well defined. All the components expose the functionality on all API [30].

Polymorphism:

As the architecture of the web app is designed for the cross platform devices, but the basic code can be shared across platforms interacting with specific features.

Many other factors contribute to the mobile solution. All these include mobile device, wireless connectivity. Each application model is made for mobile development. Some common key factors are considered the architecture. Choosing the best and correct architecture is the main aspect of the factors. The architecture is based on the users as it is a cross platform so it should support all the devices and above all the input fea-

tures are based on touch gestures as the architecture should be suitable for that. The architecture should be made appropriate for all the particular application [31].

User choice:

Major focus is on the end users of the application. The user should find it easy to navigate between pages as the device support touch as the main input features from the user, as the application should synchronise with the system and the user.

Device type:

All devices should be supported irrespective of the Operating system.

Security:

As the data is sensitive and it should be made easily available from the server and the development should be made possible showed for the whole devices.

As the web application is based on cross platform device oriented there are main two devices such as iPhone development and Android development, so the application should be tested and executed in either of the two major SDKs, hence the application SDK is considered [33].

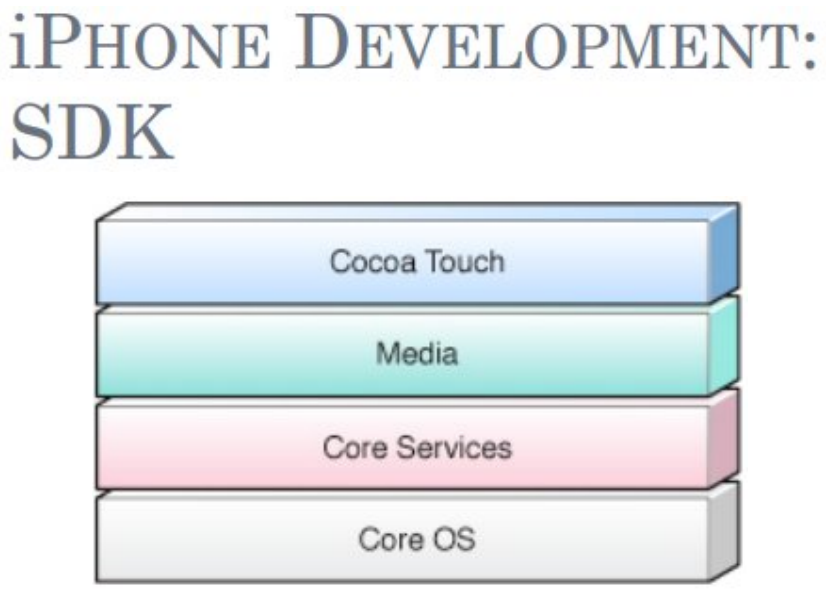


Figure 15 iPhone Development Stack [33]

iPhone Development: Application Life Cycle

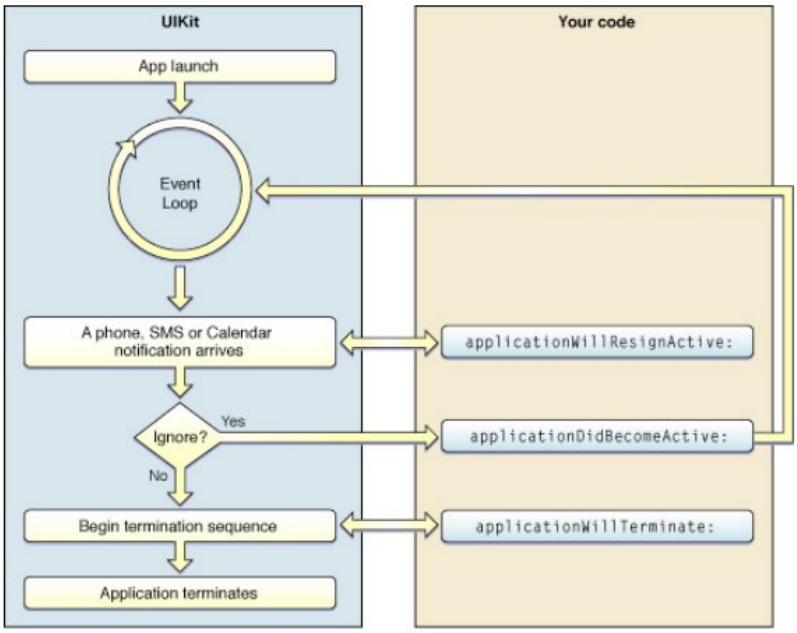


Figure 16 iPhone Development Cycle [33]

Android Development: The Stack

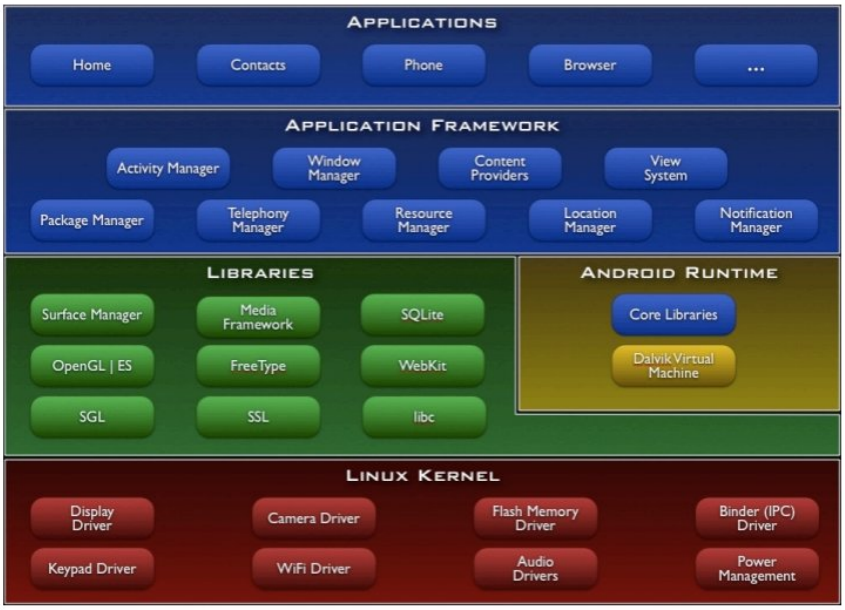


Figure 17 Android Development Stack [33]

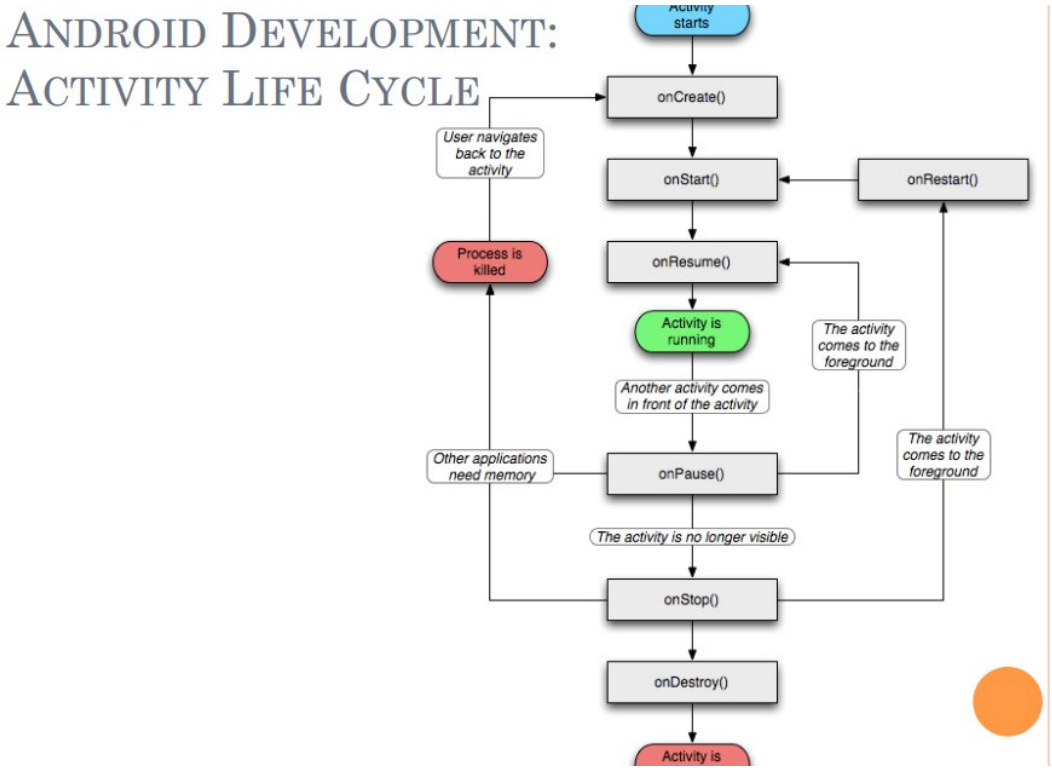


Figure 18 Android Development cycle [33]

4.3 Mobile Webapp Architecture:

The main goals of the architecture are [34]

- Maintainability:
  It should be clearly structures and understandable for the user.
- Portability:
  The architecture should support all the mobile devices irrespective of the platform.
- Performance:
  It should be fast and light weight.

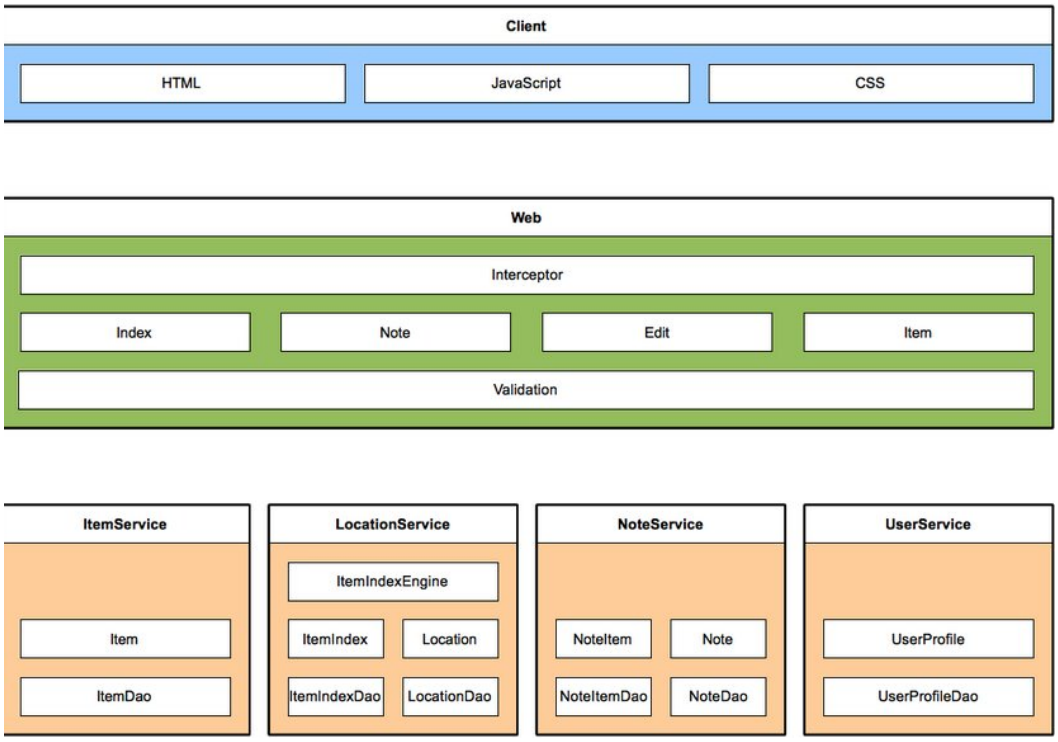


Figure 19 Architecture [34]

The application consists of 4 services [34]:

- The User Service manages user data and multitenancy.
- The Item Service manages the items.
- The Note Service handles items in a note such as adding and removing items to a note and ticking items.
- The Location Service manages locations and sorting of items depending on the actual location.

4.4 Mobile Application Development Life Cycle:

Life cycle is the important part of mobile application development there are five major phases in the development life cycle, they are [38]:

The Discovery Phase:

The first phase of the life cycle, the application enters into the first phase where the app should answer some questions such as who needs the application such as the target audience, What are the main requirements and specification of the application, Why the app is required, When the app is required meant as the target deadline, Where is the application's main focus is about. These questions should be prepared during the discovery phase.

The Design Phase:

According to the requirements, specification of the application in the discovery phase, the design is made available as the functional requirement of the project is developed. The workflow charts are made available. The frameworks, languages are reviewed and the choices are made for the design phase.

The Development and Testing Phase:

Third stage the important stage in application development, the coding with the web application languages and the mobile framework tools are chosen in the development stage, each and every requirement is considered and coded accordingly. After the development stage it's the testing phase, there are mobile app testing tools are available to make it simpler and easier, there are some emulators and simulators are also used for testing to make the user look and feel with rich experience

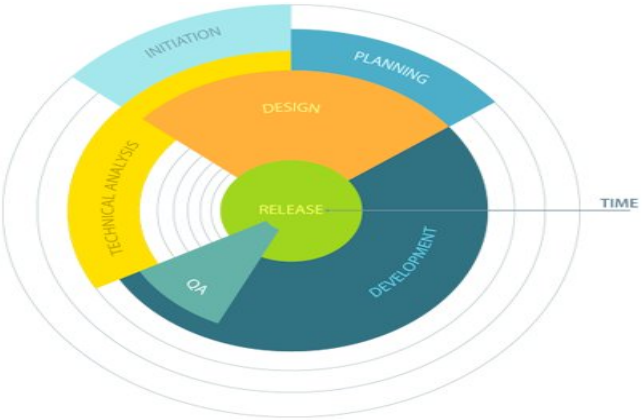


Figure 20 Life cycle [38]

The Deployment Phase:

After the testing phase the fourth phase is the deployment phase, the app is now ready for the deployment is the app is the native app it is launched and published in the apps market/store, but if the app is the cross platform application then the mobile web app is deployed in the mobile devices using the mobile web browser.

Maintenance and update phase:

Last phase but the important phase is that regularly the app should be maintained and updated; this phase is the post development phase.

CHAPTER 5

MOBILE APP DEVELOPMENT

5.1 Introduction:

As the architecture for each and every SDK of the mobile component was discussed in chapter 4 by analysing the architecture carefully, the best frameworks discussed in chapter 2 are chosen for the application development.

5.2 User Interface Development:

The overall outline of the design is analysed when the result discussions are considered by using the chart format, hence the mobile web app is designed using the language HTML5, CSS and jQuery with the framework jQuery Mobile. The system is designed and developed as such it makes easier access for the user to obtain the information from the travel website and made available in the smart phones or tablets for easier access. The functional aspect of the application consists of mainly the Routes and services of the buses in Sheffield along with the map details for clear understanding.

5.3 Module Designs:

The mobile web app is designed to develop five main modules according to the user's choices such as

- Routes and Services
- Search by Routes
- Next Bus Details
- Popular Destinations
- Feedback

These modules are controlled with by the home screen that has the main access to all other pages of the mobile.

5.3.1 Design of Home Screen:

The home screen is the first page in the web app it has the control to other page it is linked through the list view of jQuery mobile components. Thumbnails are added in the home screen to make it easier for the user. The mobile web app of home screen is displayed in chrome browser, a mobile simulator and with the tablet. To show the difference and high end richness when the app is executed in a mobile devices.

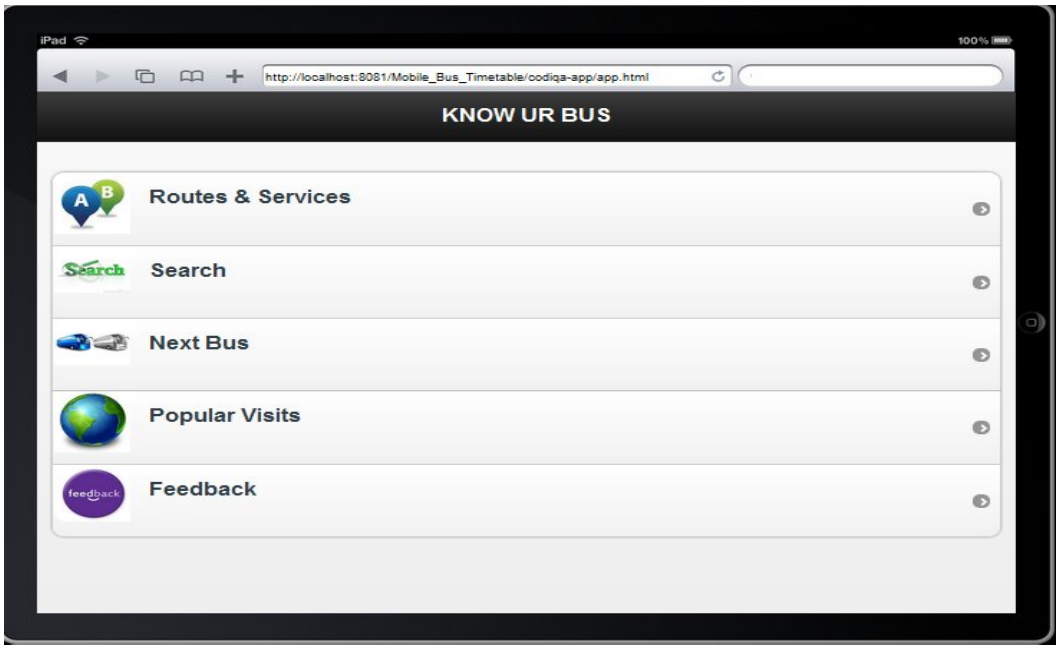


Figure 21 Home Screen page (iPad Simulator)

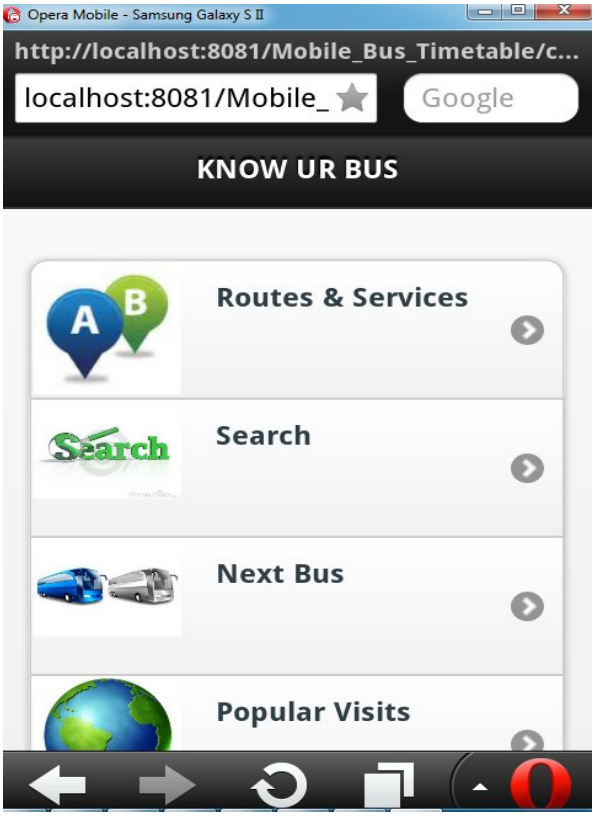


Figure 22 Home Screen page in Samsung Galaxy

5.3.2 Routes and Services:

This page displays some of the important routes in Sheffield, as there are many routes, it has been considered for displaying certain routes. The UI component used in jQuery mobile is the list view with the dividers for separation. The Figure 23 and 24 shows the tablet simulator and mobile simulator of opera mobile displaying the list of all routes in Sheffield. As the routes are clicked, the page is navigated to the next page with list of bus services in a particular routes the (Figure 23) shows the screen. The next page displays the stopping and timings of the particular route the (Figure 24) show the timings screen.

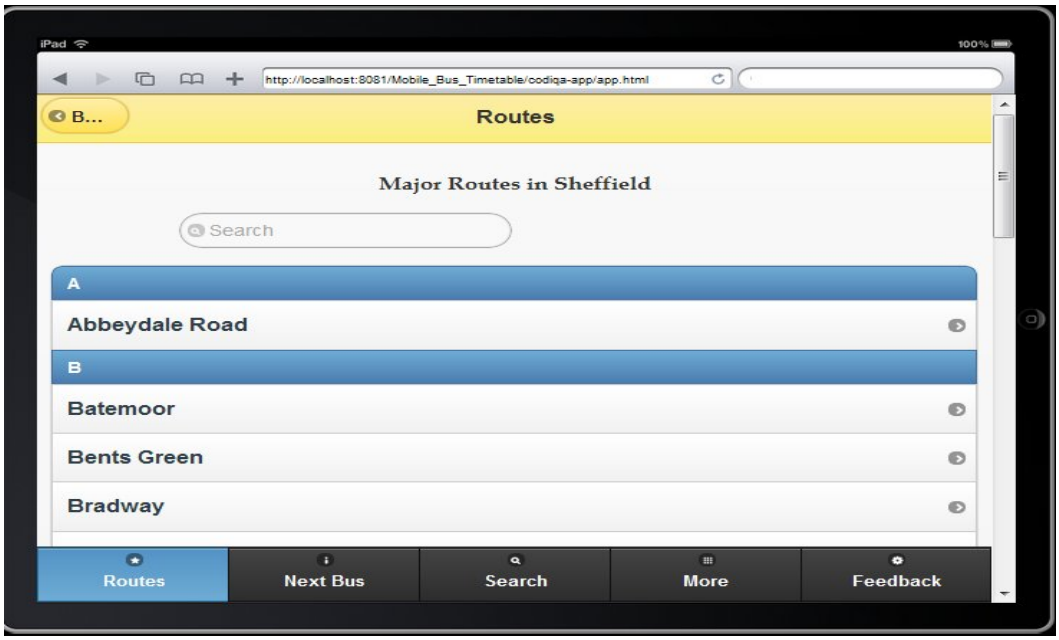


Figure 23 Routes and Services Screen – Major Routes

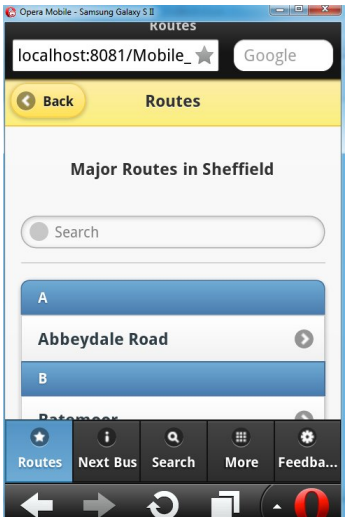


Figure 24 -Routes and Services

The Figure 25 and 26 shows the navigation to the next page where the list of services that are made available for the routes

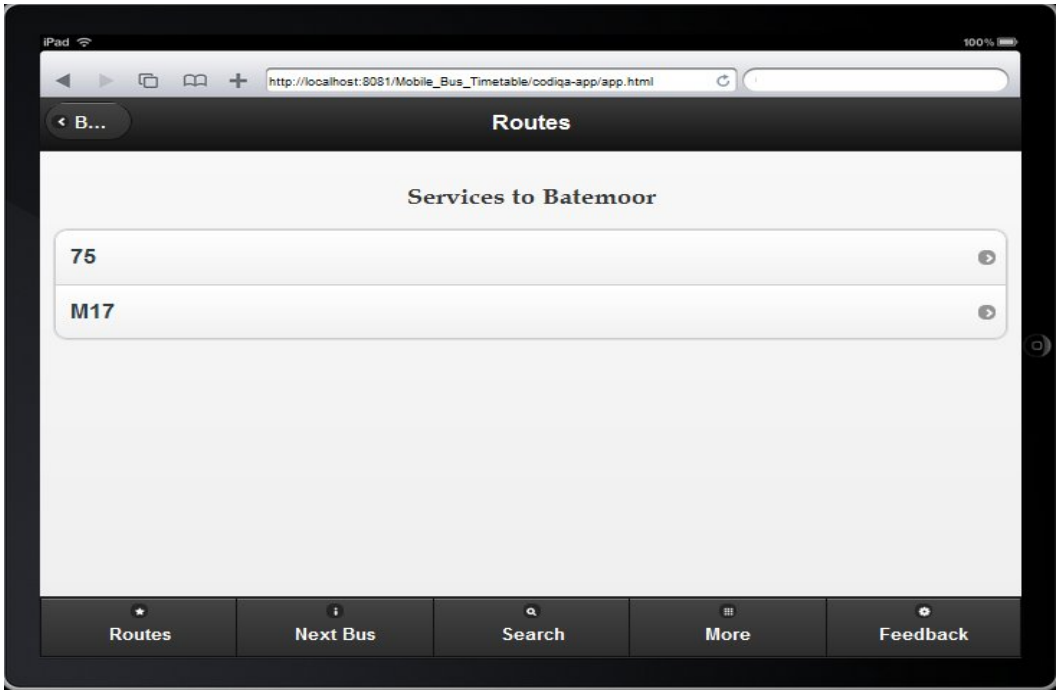


Figure 25 List of Services

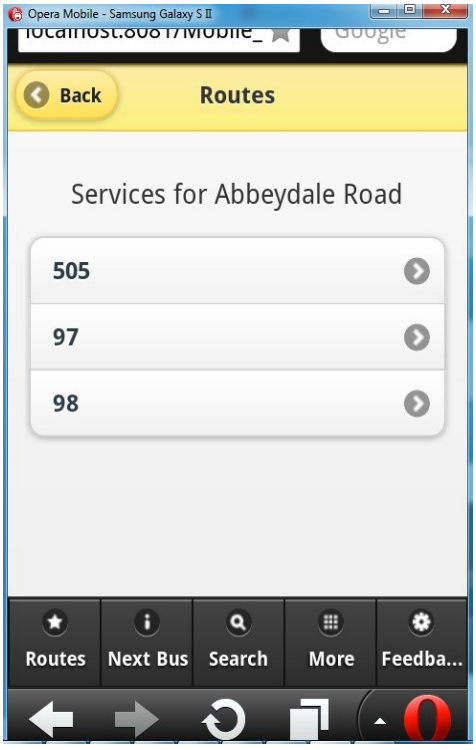


Figure 26 List of Services (in Mobile Simulator)

Once the listed services are made available the user can navigate to the current page as shown in the figure 27 and 28, it displays the details of the stopping and timings of the routes with the Operator details

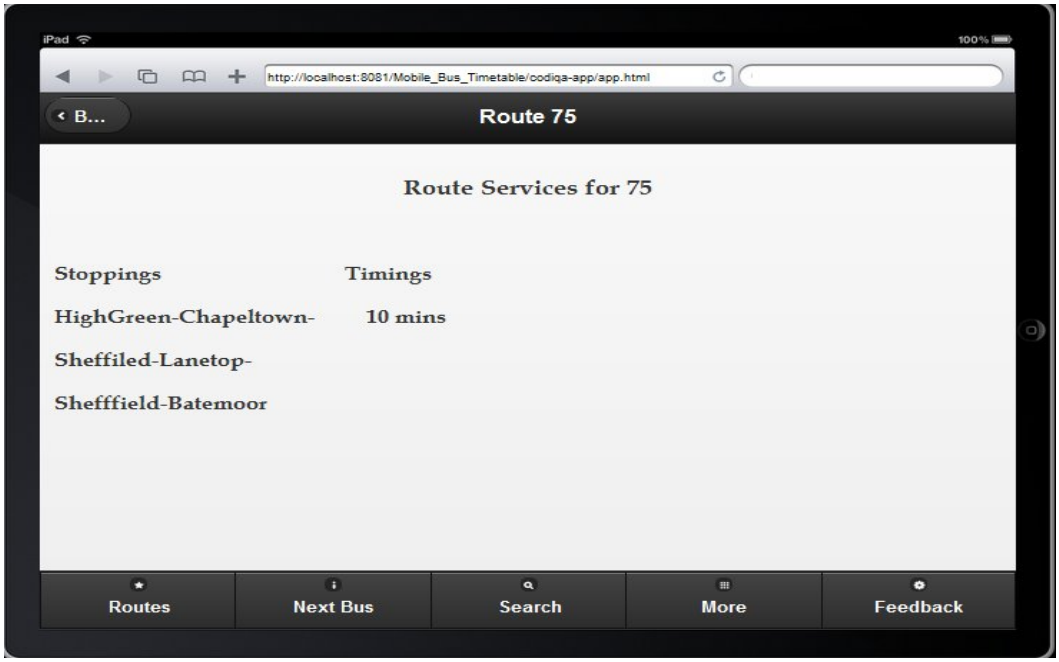


Figure 27 Stopping and Timings

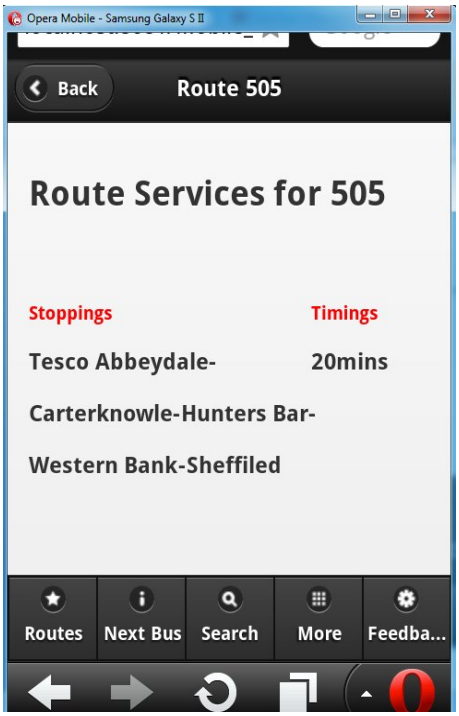


Figure 28 Stopping and Timings (in Mobile Simulator)

5.3.3 NEXT BUS SERVICES:

This is the important services offered by the mobile services, is that finding the next bus that is available with the timing of the arrival of the bus. The figure 29 and 30 shows the outline of the next bus page both in tablet and mobile devices.

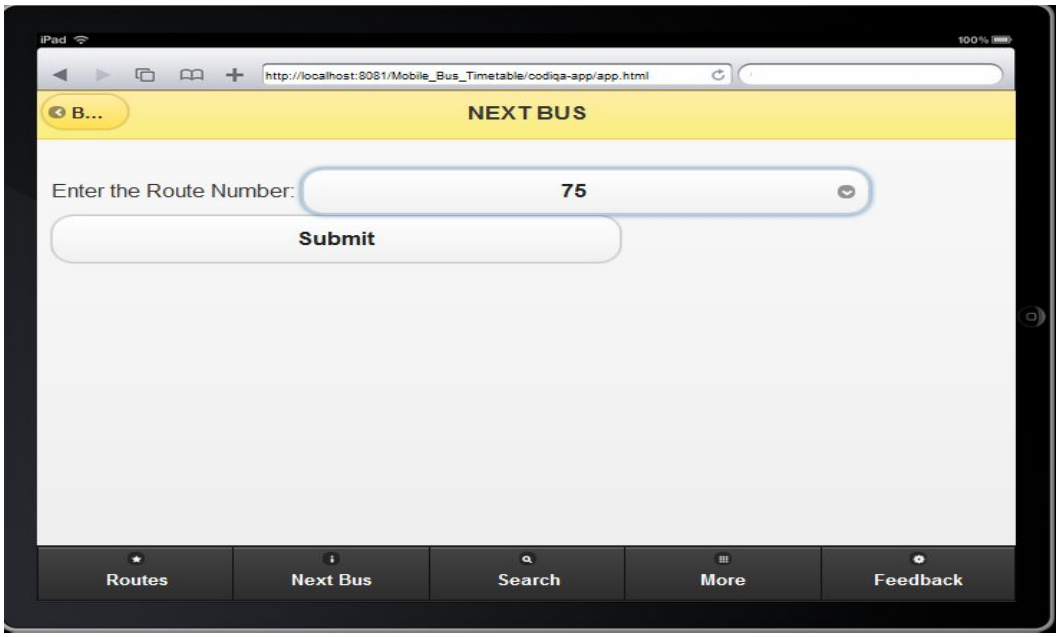


Figure 29 Next Bus Screen- iPad simulator

Figure 30 Next Bus Screen-Mobile Simulator

The figure 31 and 32 clearly shows the list of route numbers of next bus page, it has route numbers that are added to the database along with the details, once the route number is selected and submit button is clicked.

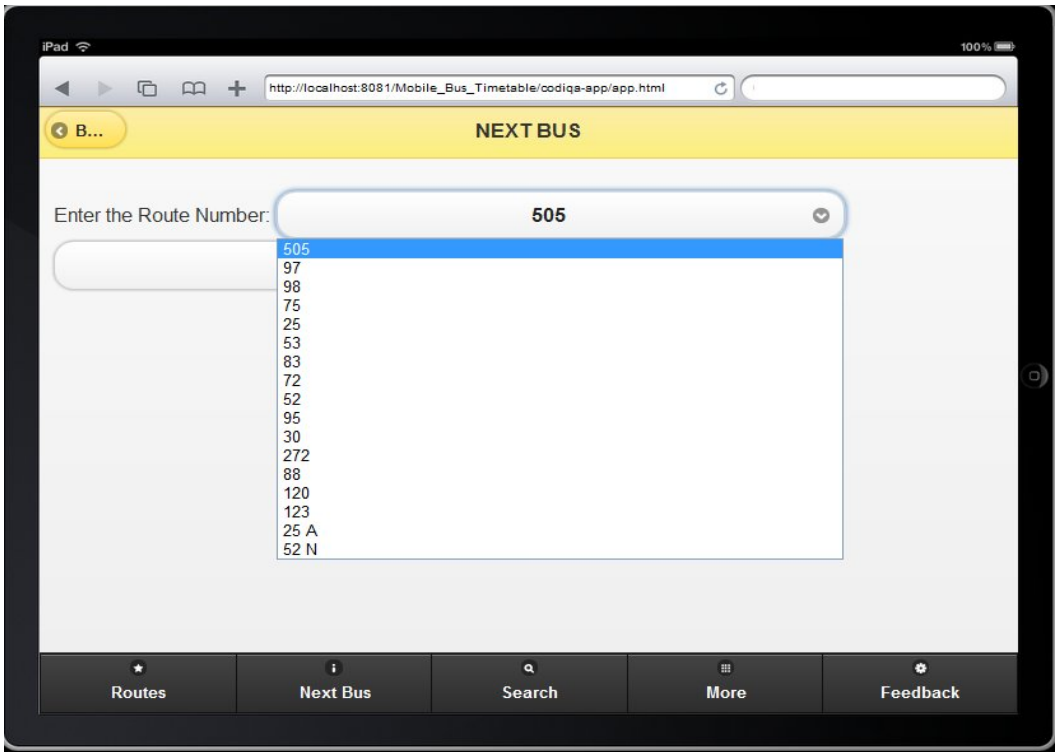


Figure 31 Next bus Services with Route Numbers

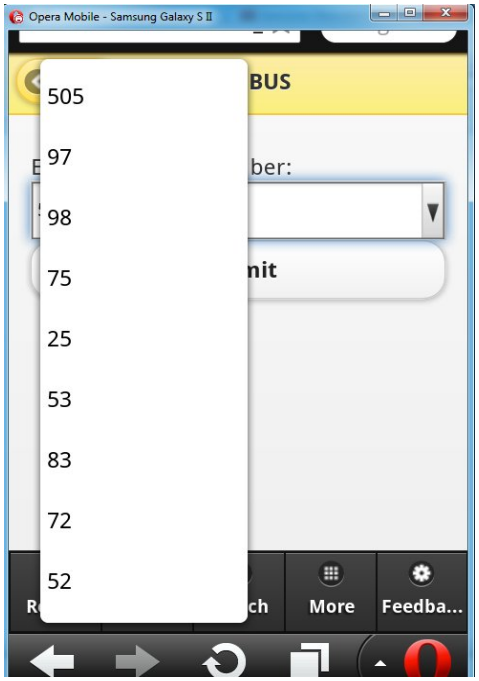


Figure 32 Next Bus Services with Route Numbers

The below figure shows the particular route with the timings and the operator details are displayed both in the tablet pc and in mobile simulator

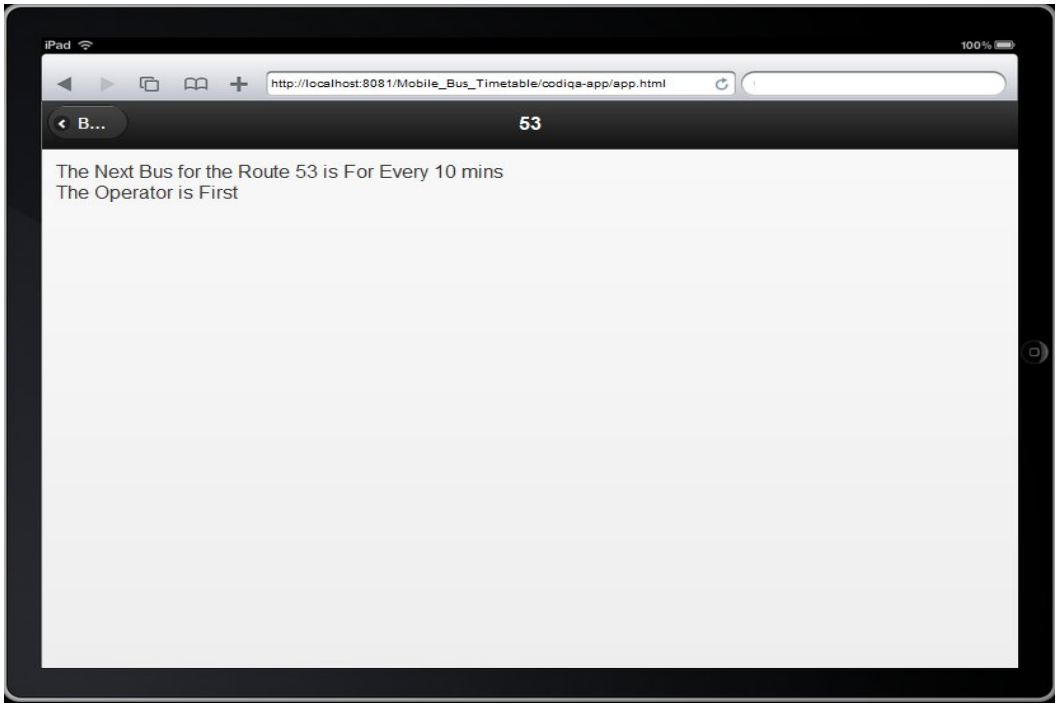


Figure 33 Next Bus Service details

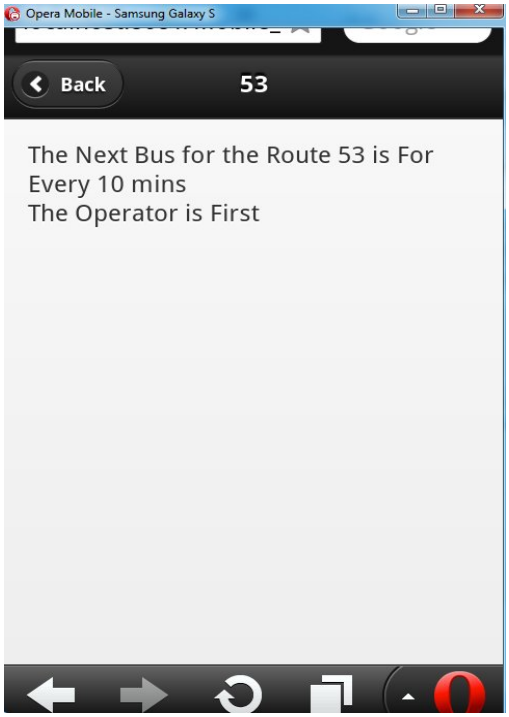


Figure 34 Next bus service details

5.3.4 Search Bus Services:

The module is basically to search the details of the routes form source to destination, along with the stops and timings. The below figure shows the list of route numbers to be searched.

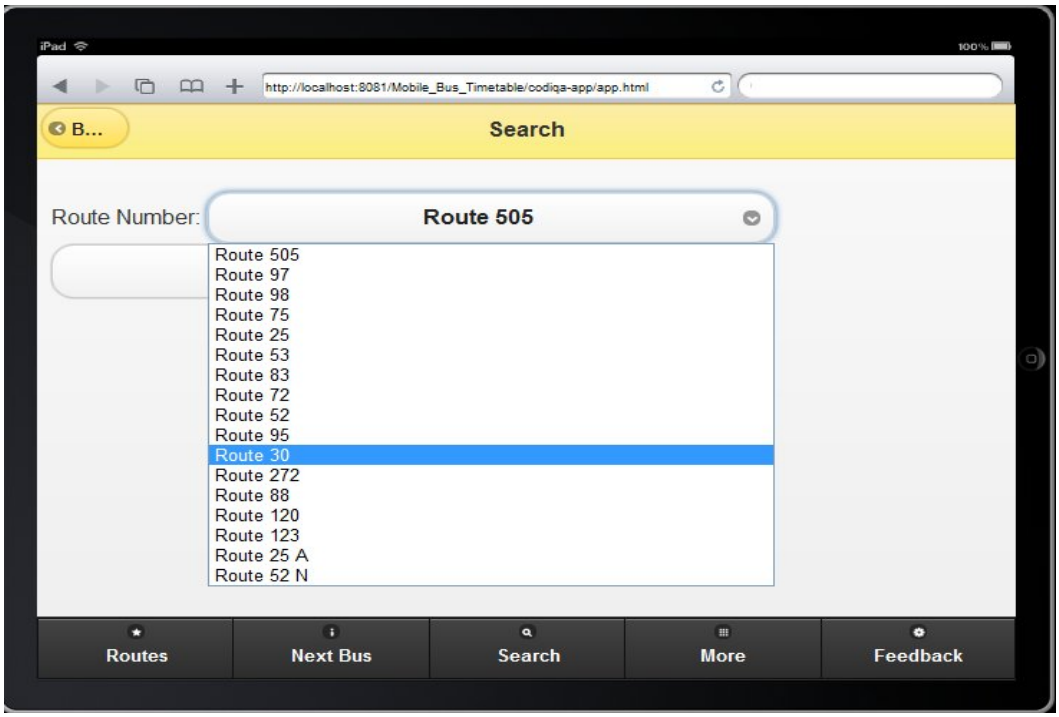


Figure 35 Search bus routes services

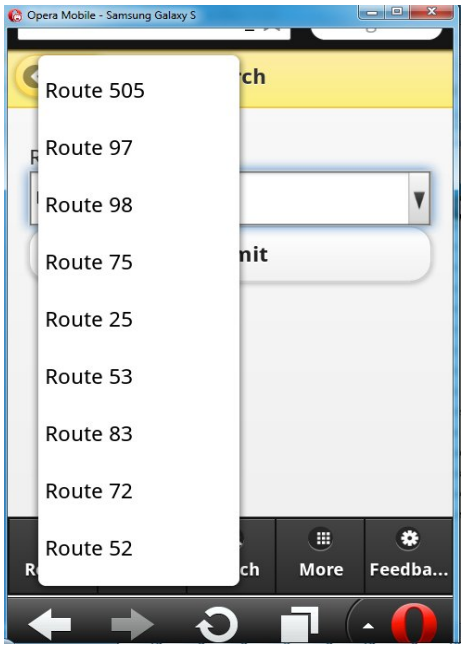


Figure 36 Search bus services in Mobile Simulator

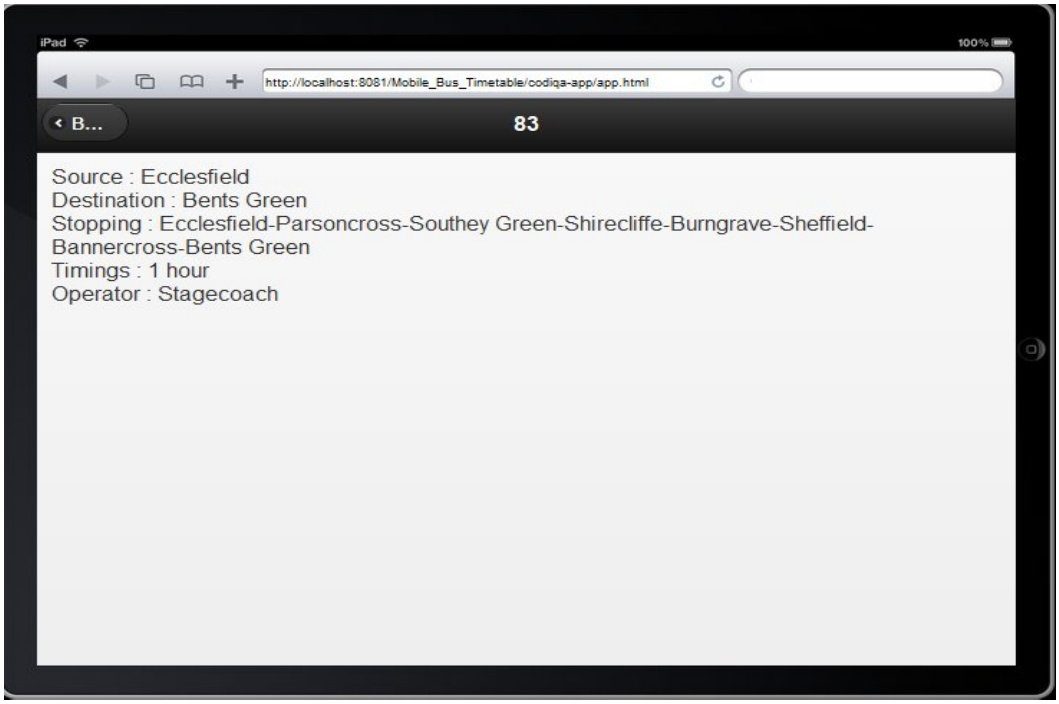


Figure 37 Search details

Figure 38 Search Details for the route

5.3.5 Popular Destinations:

Most popular destinations in Sheffield are considered and added as the list, as the user clicks any of the destinations they will be navigated to the next page with the map of the destination along with the list of bus services displayed.

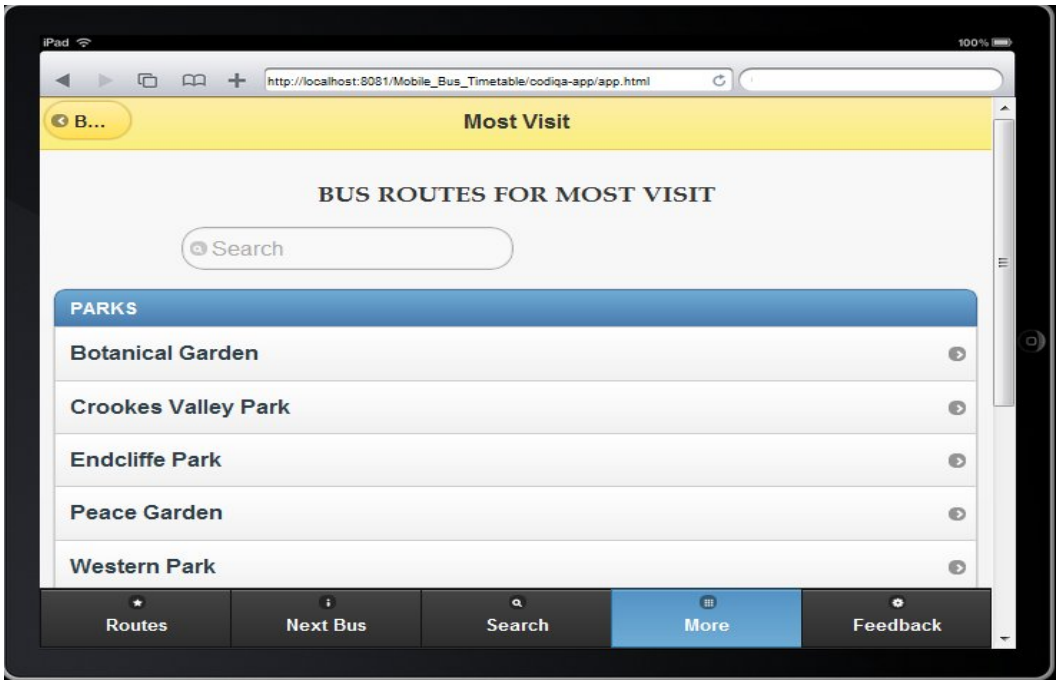


Figure 39 List of Popular destination

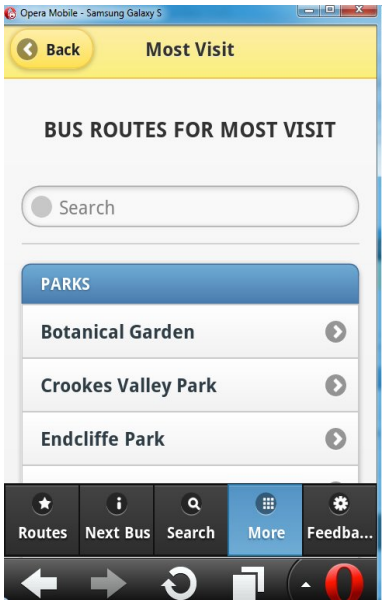


Figure 40 Popular destinations

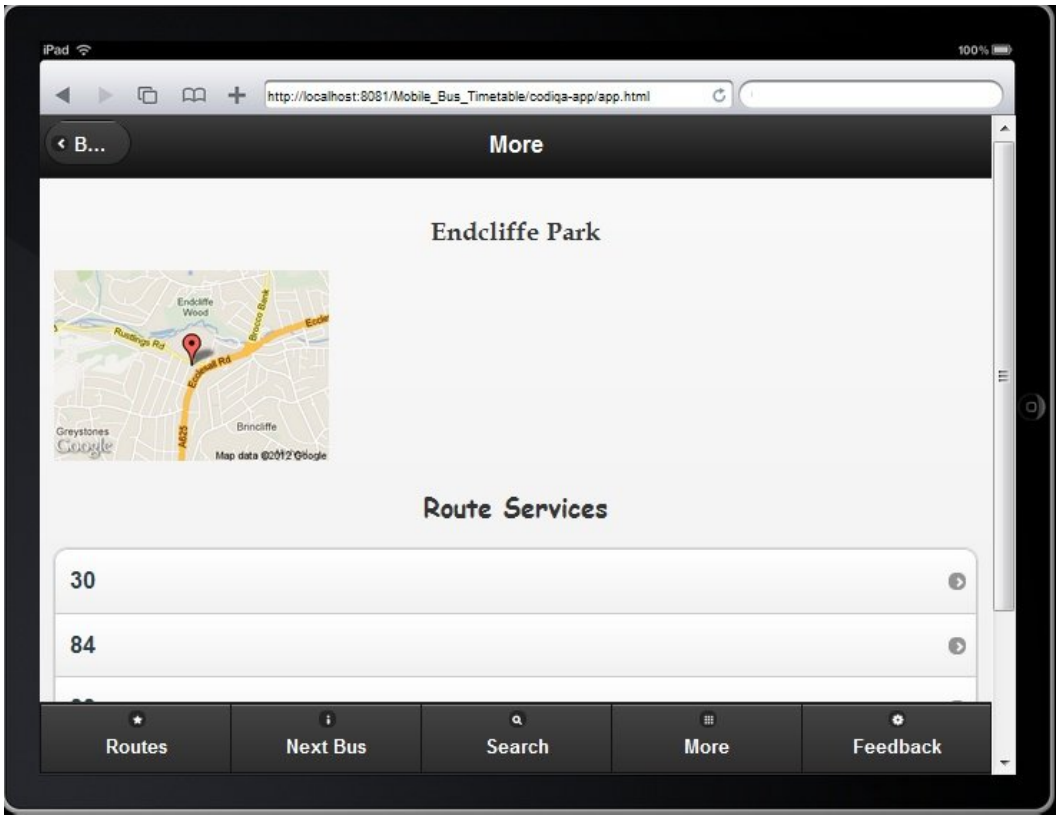


Figure 41 Destination with map and map marker

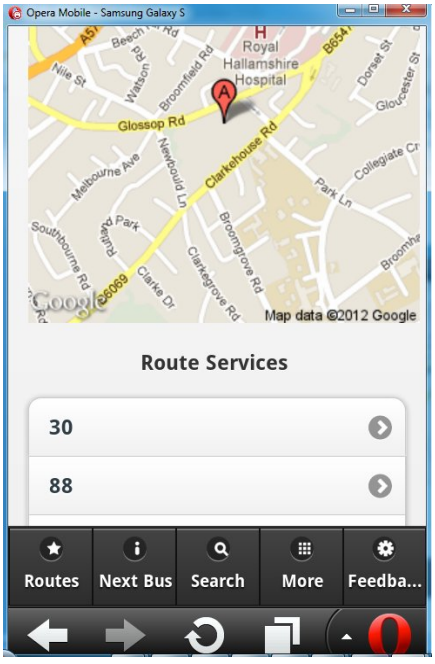


Figure 42 Destinations with map

5.3.6 Feedback:

Feedback is the last services provided in mobile bus timetable, it helps the user to give suggestions and opinion for the mobile services that is provided. The details are entered and stored in the database for the future references for the developers and to enhance the features in near future.

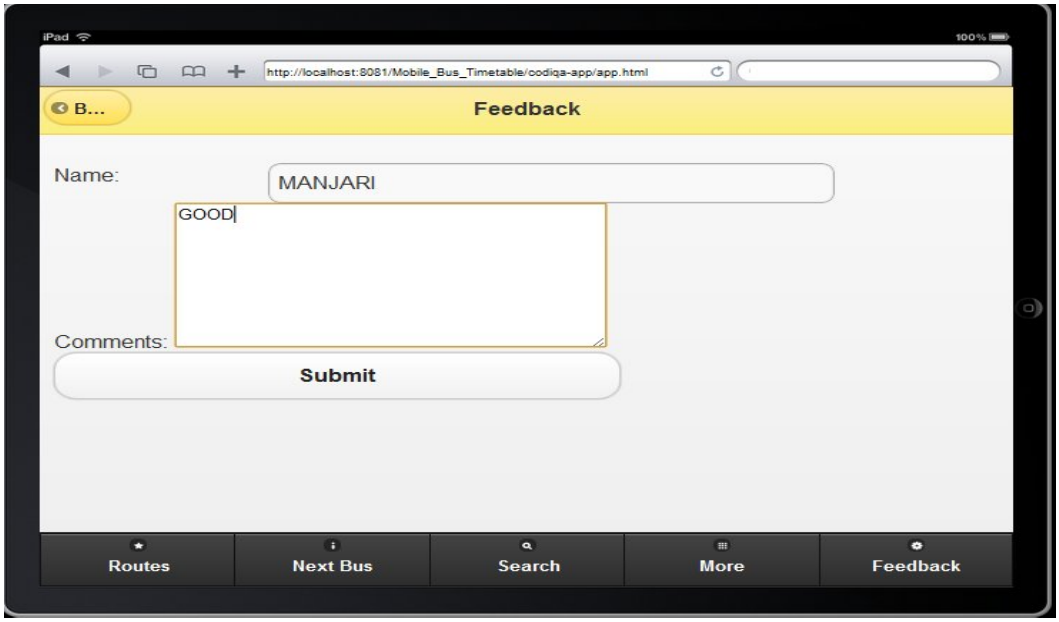


Figure 43 Feedback form

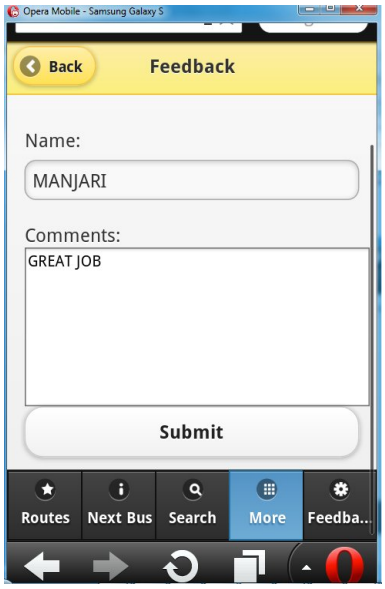


Figure 44 Feedback form in Mobile simulator

Once the feedback form is submitted the data is stored in the database and the server displays a thank you message for the opinion for the user.

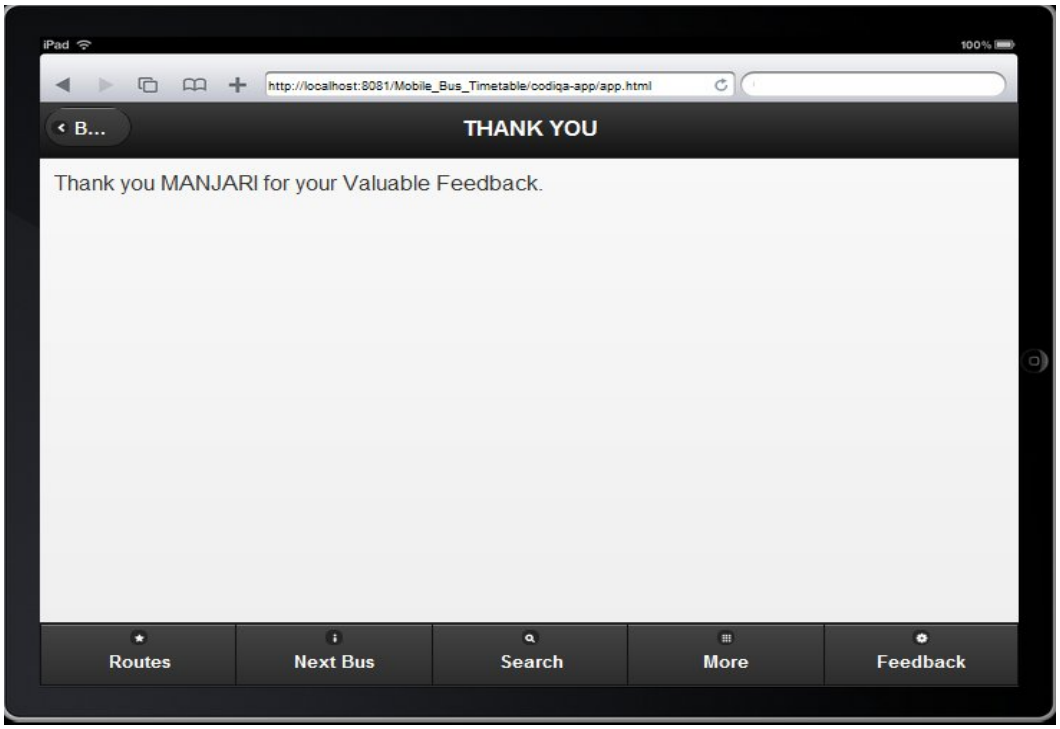


Figure 45 Thank You page

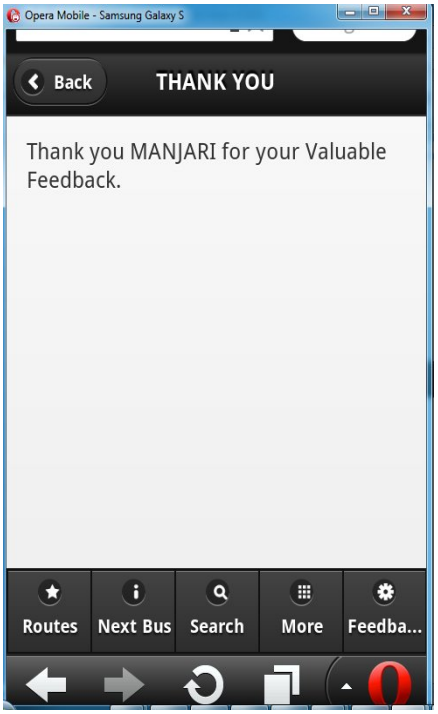


Figure 46 Thank You page in Mobile Simulator

CHAPTER 6

TESTING

6.1 Introduction:

Mobile application testing is a process that is developed for the mobile devices tested according to the functionality. There are some mobile applications testing for overcoming the important challenges such as different models of the mobile devices that differ in screen size, input methods, compatible with all the mobile operating systems. As the new model mobile devices are mainly consider input gestures and keystrokes. The developed mobile application has different types of testing as [35]

- **Functional Testing**:

Application is designed and developed according to the user's requirements.

- **Laboratory Testing:**

Simulation networks are carried by network carriers, the mobile network carriers also play an important part in testing the application as it shows the response of the application and the time of downloading the application is calculated in the laboratory testing.

- **Performance Testing**:

Application is tested on all conditions such as using the criteria for the input functionalities, carrier support, and device compatibility.

- **Interrupt Testing:**

The developed application is tested under different circumstance with several interruptions like incoming calls, network coverage.

- **Usability Testing**:

The success of the application is achieving the goals and making the user to get a favourable response.

- **Installation Testing:**

The applications are pre-installed on the mobile device. Native application can be installed from the stores.

- **Certificate Testing:**

Each mobile device is certified according to the operating system at different platforms.

6.2 Process of Testing a Mobile Application:

A mobile application consists of two major testing processes such as by handheld devices and by using Emulators/Simulators.

Handheld Testing Methods [35]:

The developed mobile web application can be tested by using a real time handheld device, the major advantage of testing the mobile app in handheld device is that, the appearance, battery backup, performance, interruption due to phone call, network carrier are tested in real time.

Mobile Simulators [35]:

Simulator are the one which make the user to experience the way the application look alike in the real environment (example PC based flight simulator, PC based mobile simulator).

Mobile Emulators [35]:

Emulators are the software that are made available for one Operating system and made executable in another operating system. Analysing and testing defects are made easily with the emulators; increase the usability methods, test coverage and scenario based testing.

6.3 Comparison of Emulators and Simulators:

Simulator is the imitation of the environment. In a mobile based simulator the mobile device such as iphone, Android, Blackberry are made available in the real environment. Emulator is the imitation of one object with another object.

6.4 Tools for Testing:

The tools are available for testing the mobile web app or the native applications, these emulators are user friendly [39].

Google Android Emulator:

Android applications or the web applications that has to be run on Android devices can use Android Emulator. This can be installed in windows pc by downloading the complete SDK.

Figure 47 Android Emulator

Official Android SDK Emulator:

The Android SDK which has all the features of hardware and software of the typical mobile. As per the real time navigation, the control keys are used according to the key press and keystrokes.

Figure 48 Android SDK Emulator

Test iphone.com:

This is a iphone application web based simulator which can be tested quickly as in the iphone device the tools works using internet explorer, firefox and safari

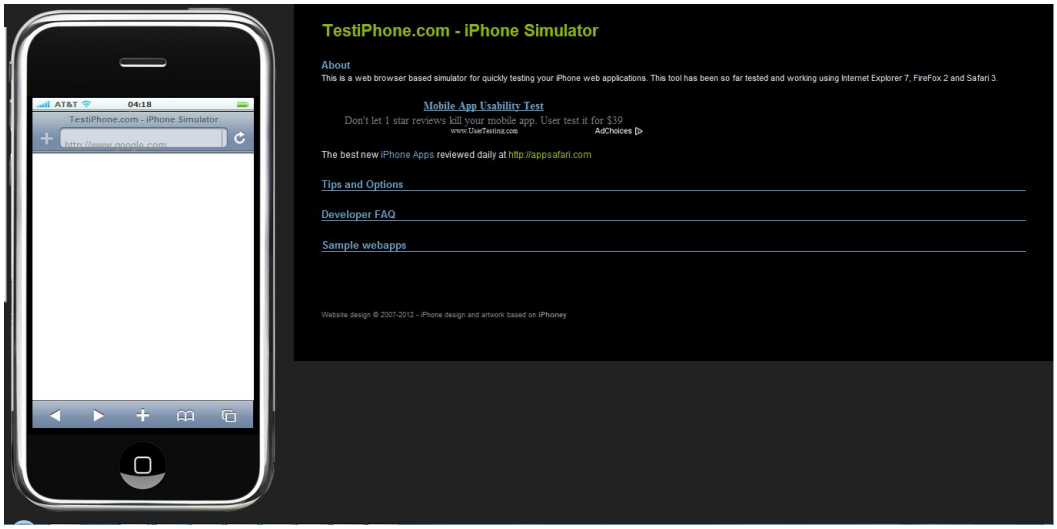


Figure 49 iPhone Web based Simulator

Blackberry Simulator:

The simulator is used to test the mobile app as to demonstrate how the blackberry device software, screen and keyboard work and simulate the same behaviour as the real one.

Figure 50 Blackberry platform

Nokia Platform and Device SDK:

Nokia simulator is the general simulator with the SDK consisting of all the features that the regular Nokia mobile have it. Cross platform applications also support nokia platform along with the symbian application.

Figure 51 Nokia platform

Windows Mobile Emulator:

This is the official windows mobile package the adds emulator preinstalled along with the visual studio.net. The emulator makes the testing for the windows application

Figure 52 Windows Emulator

iPad peek:

This is the simulator (or) just a device testing tool that helps to experience how the website looks in iPad. This simulator gives the real time experience and rich feel and look for the application

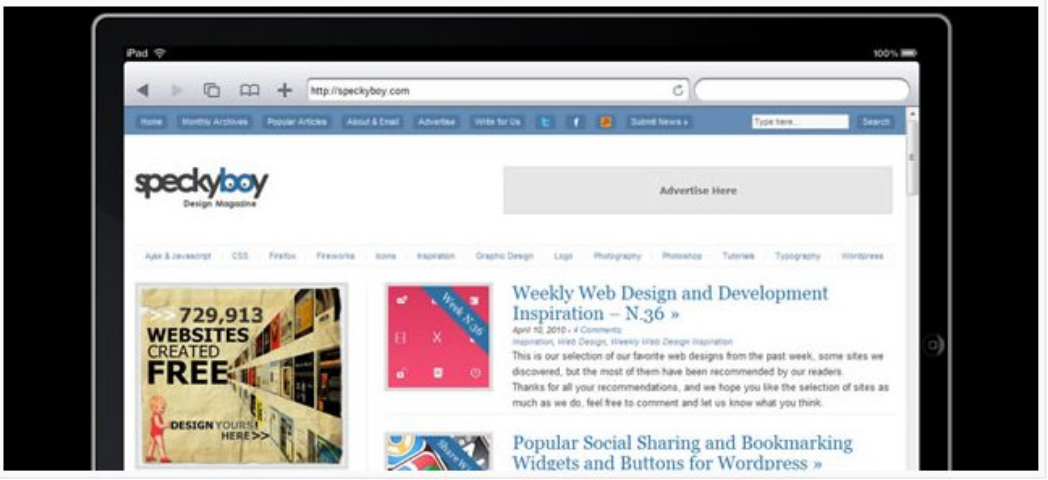


Figure 53 iPad web based simulator

Opera Mini Simulator:

This is the most popular simulator which is tested by most of the web application in mobile. It gives the user the feel that it exactly used in the handset

Figure 54 Opera mini simulator

6.5 Testing Practises for Mobile web app:

The mobile web app is tested using the following criteria they are [40]

Browser/Device Compatibility:

The browser and the device should be considered when developing an application for the mobile devices. The browser in the mobile devices should support the following details.

HTML5/JavaScript support:

To build (or) design an interactive application UI JavaScript and HTML 5 (new supporting language for mobile web application).

XML HTTP Request:

A smooth browsing experience is needed for the user while browsing the website.

CSS Support:

The elements and styles of the webpage gives the user rich experience, according to the mobile device the appearance and layout are changed.

Network Carrier:

The network carrier also plays an important in testing the application. The Good network carrier always displays the better methods in loading the smooth experience to the user.

Testing Methodology:

The testing methodology is used for the web development testing, while testing the mobile application. The testing methods / process are

Test design specification:

It specifies and defines details approach taken to perform a mobile application taken to perform a mobile application. The major objectives are to identify the flows and features, linking, navigations, scenarios and criteria.

Test Cases:

Derived from the test scenario and criteria, it is a set of actions, test data/ user input data, conditions and results.

Every mobile device is peculiar in their functions by deciding what and how the test methods are used. These are the testing types, tools and techniques that support all the mobile device and mobile applications.

ADA Compliance Testing:

The Mobile application when it is developed has to undergo certain criteria by following the rules and standard of the mobile web best practices (MWBP).The following tools and techniques are used as

URL Test harness it is checked via W3C mobile OK checker, free W3C services. The next is the Apple Assistive Technology for the screen devices and support compatibility.

Automated Testing:

Testing is achieved using emulator. This test is run on the device and controlled by PC. During the testing the performance tool is used to check the performance of the mobile applications.

Egg plant: This is a testing tool which emulates the mobile devices and automates the testing.

Database Testing:

It is a very important testing, where the data integrity and database manipulation without any modification. The database testing is a manual type of testing.

Compatibility Testing:

Mobile application is tested with the selecting device according to the operating system, screen size, display and features. These are tools for testing the compatibility such as

IPhoney is a free iPhone simulator, Opera Mini is asimulator which supports the entire browser and it is free, Adobe Central CS5 allows planning, previewing, testing and delivering mobile application.

Functionality Testing:

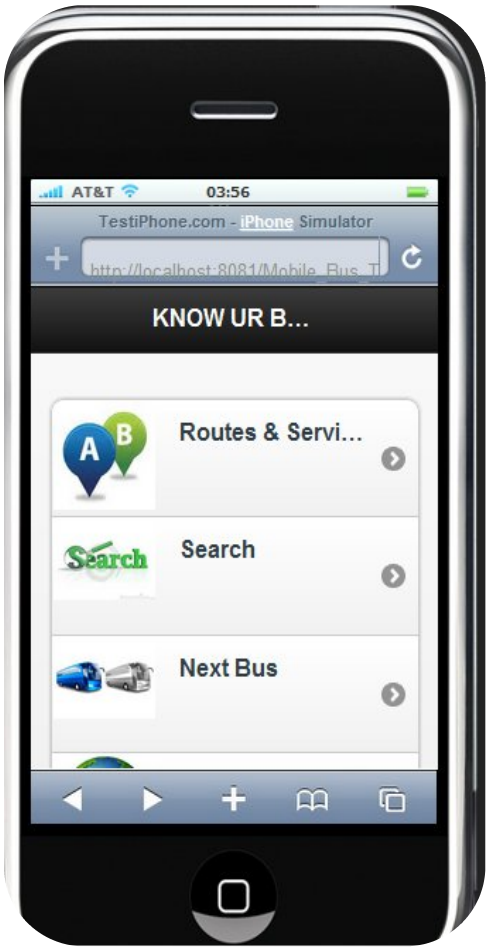
This kind of testing controls the storage media handling events. It is a black box testing which assures that the application functions as per the specifications.

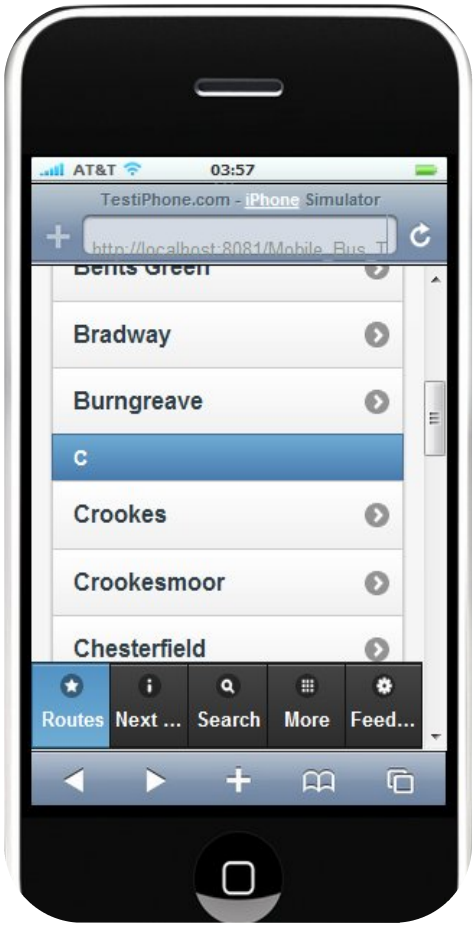
Power Consumption Testing:

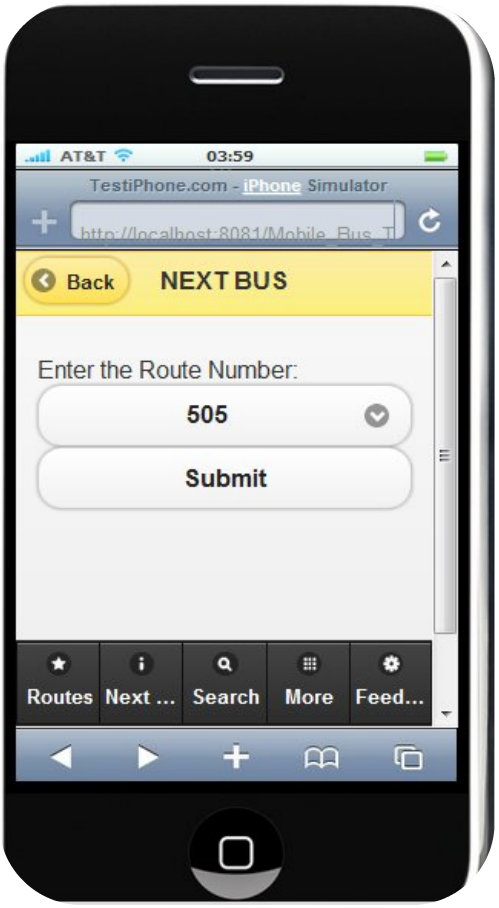
Testing is used for the battery drainage caused due to the application. The performance of the application is also weakening the battery life. As there are many devices each device performs differently and consumes different power status. In iPhone, iPad and in other mobile devices, the screen size, brightness are minimised , location services are turned off, push notifications are also turned off, all these can reduce the battery power and long standing battery life.

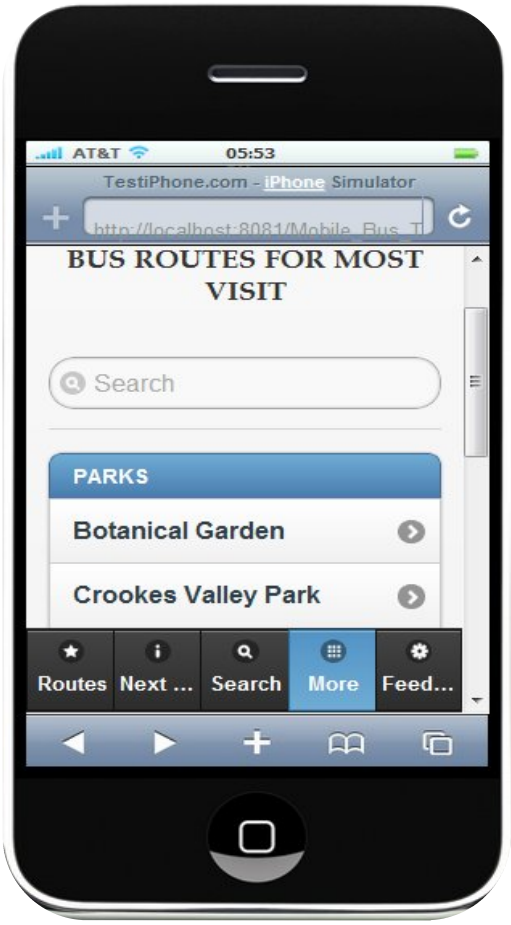
6.6 Testing - Mobile Web App using iPhone Simulator

Mobile bus timetable is tested with the help of the iPhone simulator which gives a rich experience to the user. The screenshots displayed below are tested through iPhone.






AT&T
03:59
TestiPhone.com - iPhone Simulator
Back
NEXT BUS
Enter the Route Number:
505
Submit
Routes
Next ...
Search
More
Feed...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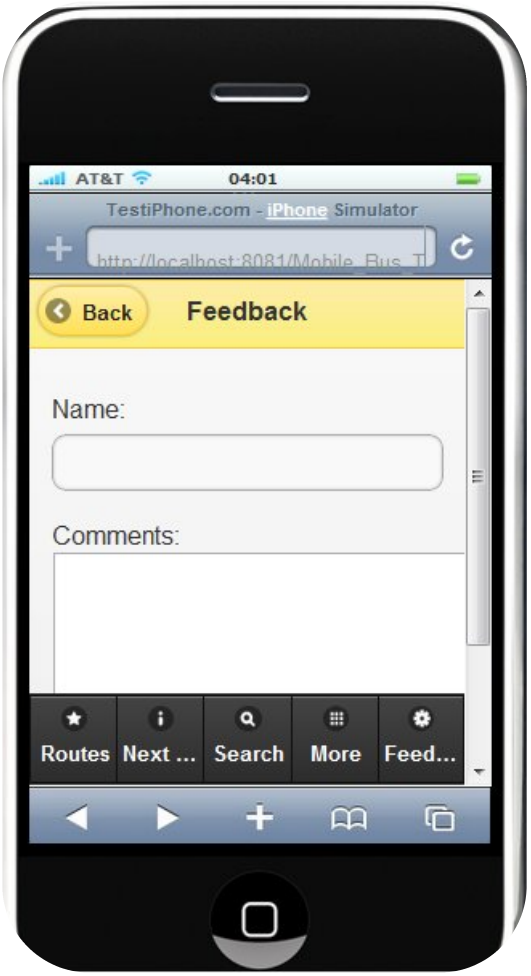
05:53
TestiPhone.com - iPhone Simulator
BUS ROUTES FOR MOST VISIT
Search
PARKS
Botanical Garden
Crookes Valley Park
Routes
Next ...
Search
More
Feed...


AT&T
04:00
TestiPhone.com - iPhone Simulator
Greystones
Google
A625
Brincliffe
Map data ©2012 Google
Route Services
30
84
Routes
Next ...
Search
More
Feed...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TestiPhone.com - iPhone Simulator
Back
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Name:
Comments:
Routes
Next ...
Search
More
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CHAPTER 7

FUTURE ENHANCEMENT

Mobile Technology is getting advanced in everyday business, compared to the native web application, the cross platform mobile web application is advantageous as the application is irrespective of the platform and operating systems. The project "Mobile Bus Timetable" a cross platform mobile web application is designed and developed to help the users to find the locations and timings of the city buses in Sheffield. The application also helps in finding the next bus services, search the routes as these applications can be enhanced by adding the alert information about the arrival of the destination to the users, GPS services can also be added in the services to find out the exact locations. Features can be added according to the user's requirements and developer's creative ideas.

CHAPTER 8

CONCLUSION

The report mainly focussed on designing, analysing and developing the mobile web application which is a cross platform mobile application technology, the project is developed for the use of the public for knowing the bus service. The report explains the methods of developing the cross platform web app through mobile by understanding the framework for the cross platform web app.

Later, the report discusses a lot of web development tools and framework methods in Literature review and report also deals with mobile development phases and analysis. The requirements and analysis stage of the report discuss about two major part of the project, the first part of the project is to develop a survey website to understand the requirements of the user and their specifications about the services through the mobile. Later stage of the survey the details are analysed using the chart format that clearly understands the variations. Second stage of the report; clearly discuss the development of the mobile applications with the clear explanations and screenshots of the mobile device.

Testing, the most important part in the documentation is also considered to be the highly recommended part of mobile web application testing with the emulators and simulators. The tools that are for testing the mobile app is also reviewed in the report, the application is tested through an iPhone web based simulator which is presented in the screenshots. Apart from these testing methods there is some other process of testing the mobile app which is also discussed in the report.

Lastly, the report deals with the future enhancements of the applications according to the user's and developer's requirements, in the near future the same application

can be added with advanced features and method, the cross platform application can be developed using a native applications. The entire project is developed as per the planned frame time and it has been completed successfully which gave an additional knowledge in understanding the mobile web applications with the frameworks and testing process and methods.

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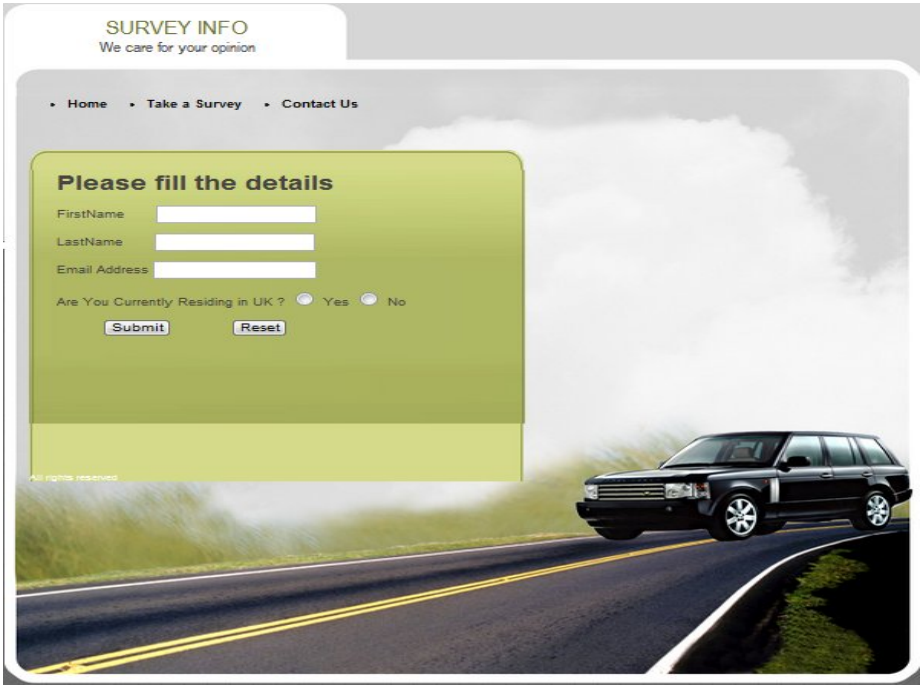
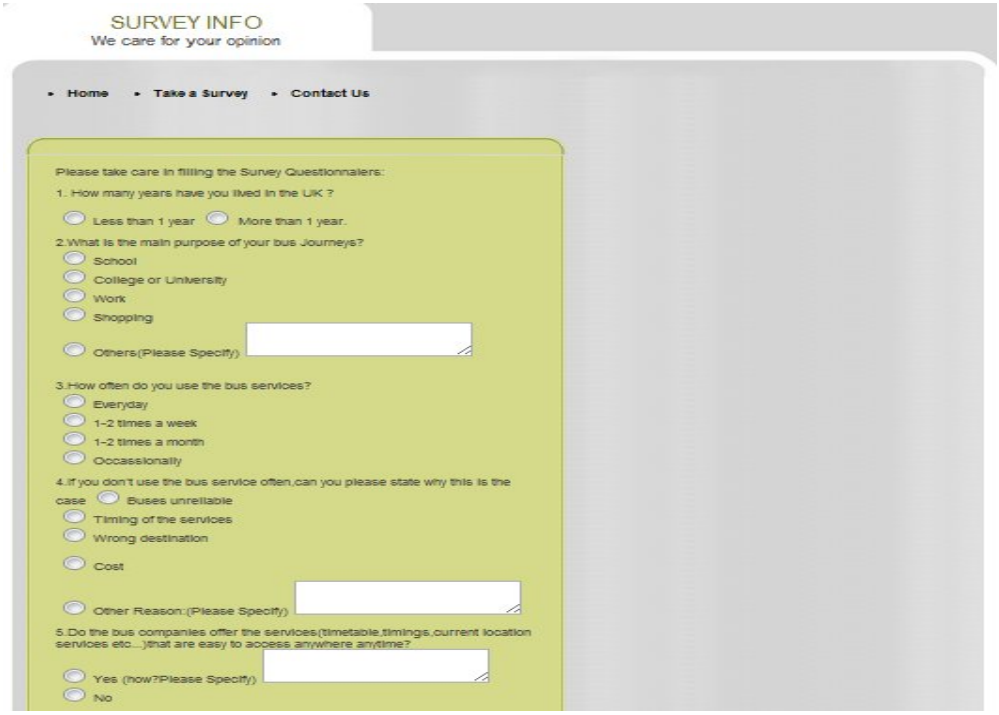
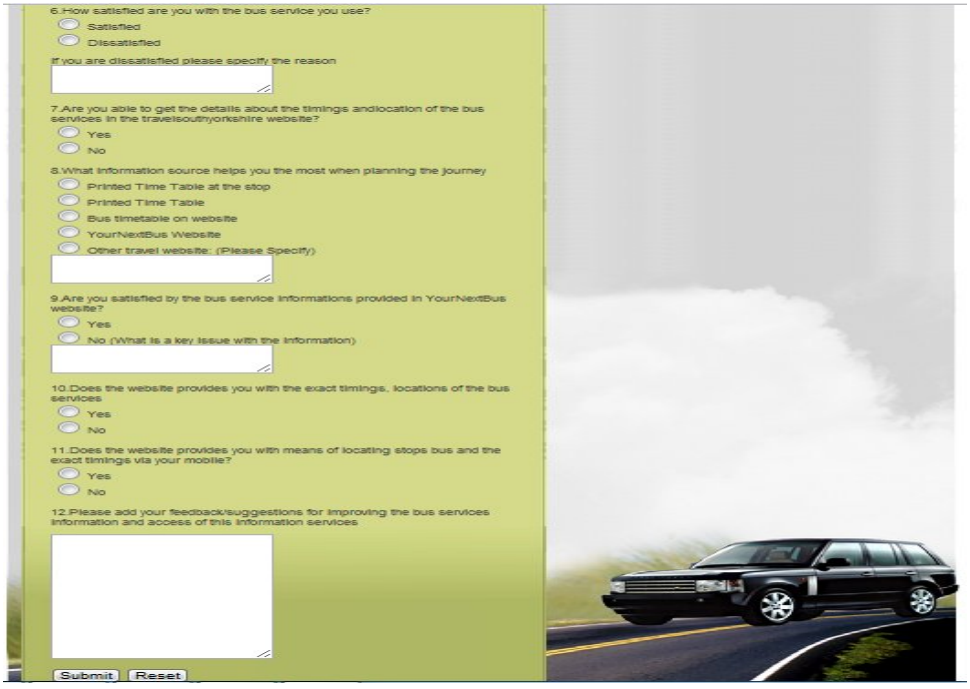
APPENDIX A

SURVEY WEBSITE



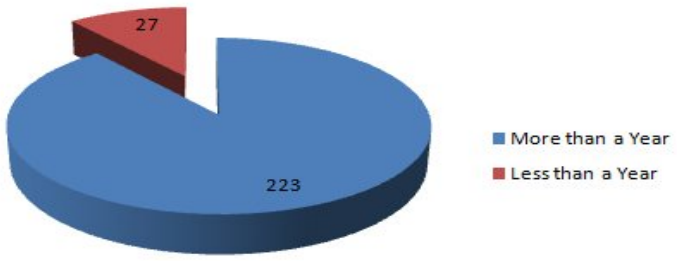

SURVEY INFO
We care for your opinion
Home
Take a Survey
Contact Us
Please take care in filling the Survey Questionnaires:
1. How many years have you lived in the UK ?
Less than 1 year
More than 1 year.
2.What is the main purpose of your bus Journeys?
School
College or University
Work
Shopping
Others(Please Specify)
3.How often do you use the bus services?
Everyday
1-2 times a week
1-2 times a month
Occassionally
4.If you don't use the bus service often,can you please state why this is the case
Buses unreliable
Timing of the services
Wrong destination
Cost
Other Reason:(Please Specify)
5.Do the bus companies offer the services(timetable,timings,current location services etc...)that are easy to access anywhere anytime?
Yes (how?Please Specify)
No


6.How satisfied are you with the bus service you use?
Satisfied
Dissatisfied
If you are dissatisfied please specify the reason
7.Are you able to get the details about the timings andlocation of the bus services in the travelsouthyorkshire website?
Yes
No
8.What information source helps you the most when planning the journey
Printed Time Table at the stop
Printed Time Table
Bus timetable on website
YourNextBus Website
Other travel website: (Please Specify)
9.Are you satisfied by the bus service informations provided in YourNextBus website?
Yes
No (What is a key issue with the information)
10.Does the website provides you with the exact timings, locations of the bus services
Yes
No
11.Does the website provides you with means of locating stops bus and the exact timings via your mobile?
Yes
No
12.Please add your feedback/suggestions for improving the bus services information and access of this information services
Submit
Reset

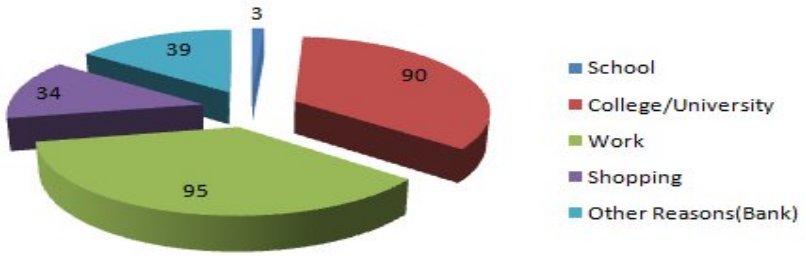
APPENDIX B

CHART ANALYSIS

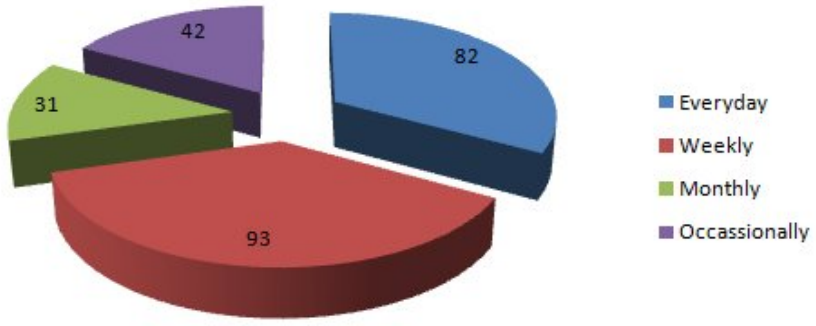
HOW LONG YOU RESIDE IN UK ?	
The Total Respondents	250
More than a Year	223
Less than a Year	27



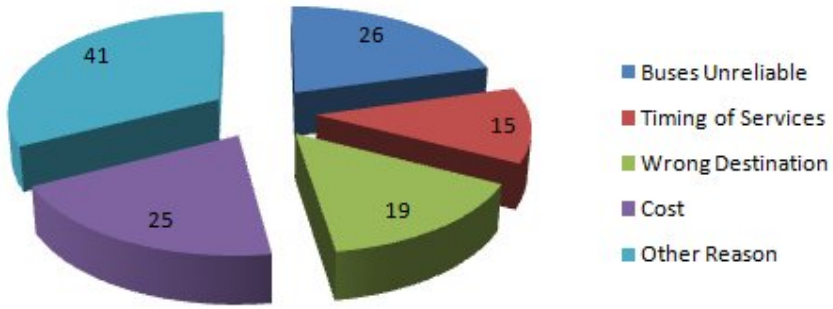
What is the main purpose of the Journey?	
The Total Respondents for the question was	250
School	3
College/University	90
Work	95
Shopping	34
Other Reasons(Bank)	39



How Often do you use the Bus Service ?	
Total Respondents	250
Everyday	82
Weekly	93
Monthly	31
Occassionally	42

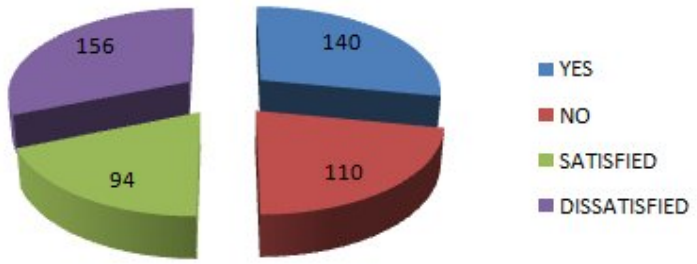


What is the Reason for not using the bus frequently?	
Total Respondents	126
Buses Unreliable	26
Timing of Services	15
Wrong Destination	19
Cost	25
Other Reason	41



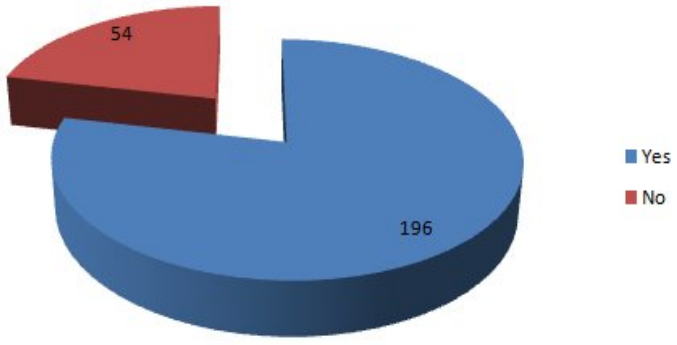
Does the bus companies offer the services that are easy to access anywhere anytime?

Total Respondents	250
YES	140
NO	110
SATISFIED	94
DISSATISFIED	156

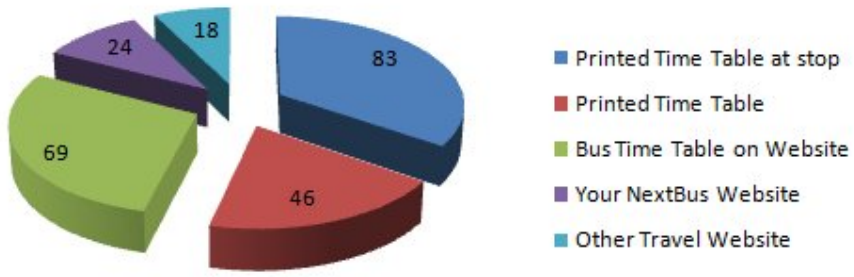


The details about the timings and location of the bus services in the travelsouthyorkshire website?

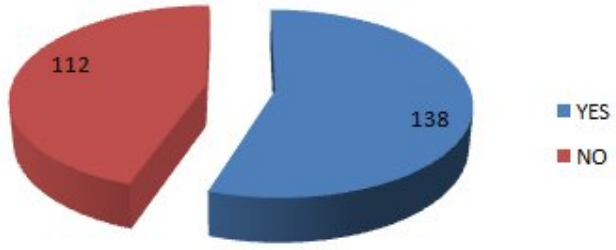
TOTAL RESPONDENTS	250
Yes	196
No	54



What information source helps you the most when planning the journey	
Printed Time Table at stop	83
Printed Time Table	46
Bus Time Table on Webs	69
Your NextBus Website	24
Other Travel Website	18

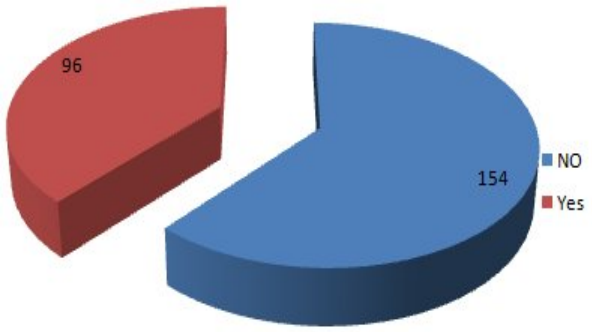


Satisfied by the bus service informations provided in YourNextBus website?	
TOTAL RESPONDENTS	250
YES	138
NO	112



Does the website provides you with means of locating bus stops and the exact timings via your mobile?

Total Respondents	250
NO	154
Yes	96



The Overall Satisfactions and responses about Bus Services

Number of Respondents	250
SATISFACTION	110
DISSATISFACTION	140