IFRANI MOBILE & WEB APPLICATION

Project Report

April 2019
Aimane Ouarour
Supervised by: Dr. Falah Bouchaib
Capstone Report

Student Statement:
“I, Aimane Ouarour, affirm that I have applied ethics to the selection of the final proposed design and in design process. I also assert that I have held the safety to the public to be paramount and have addressed this in the presented design wherever may be applicable.”

Aimane Ouarour

Approved by the Supervisor

Dr. Falah Bouchaib
ACKNOWLEDGEMENT

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1. ABSTRACT:

The province of Ifrane nicknamed small Switzerland has enormous tourist potential: varieties and diversities of landscapes, lakes and streams as well as a climate more lenient. On the other hand, mobile devices are more present in our everyday lives than ever before and as such have also become an important factor in modern travel behavior. Therefore, the main goal of this capstone is to facilitate and provide tourists and international students of Al Akhawayn University with any information concerning Ifrane city.

This project started in Software Engineering course with Dr. Bouchaib Falah, where a simple mobile application was developed. In fact, this capstone project will be divided into two parts: Mobile application & Web application. The project starts by gathering data about Ifrane and the needs of internationals students. This was done by doing surveys, meetings, and interviews with students to understand well the needs. The second part of this project will consist of converting those needs into a simple mobile and web application in which students can use it as a guide.

The mobile application is already developed using Android studio software, however, it needs some slight modifications. The last part is to develop a web application using a free open – source software such as WordPress.

The objective of this project is to have a complete, reliable, and unique mobile and web application that is expected to be an added value to Ifrane city.
2. INTRODUCTION:

The Capstone Design course is required by the School of Science and Engineering in order to get the bachelor degree in Al Akhawayn University in Ifrane. The development of this project required the use of most of the learned computer science skills: Software Engineering, and Mobile Applications Development.

I chose “Ifrani” as the name for the web and the mobile application. The main goal is to facilitate and provide tourists with any information concerning Ifrane city. The province of Ifrane nicknamed small Switzerland has enormous tourist potential: varieties and diversities of landscapes, lakes and streams as well as a climate more lenient. Its natural resources make it a tourist hub of choice for hiking, hunting wild boar and its lakes are essential for fishing.

Therefore, I believe that “Ifrani” will help the tourist and people in general to have an idea about Ifran’s events, map, and a guide by utilizing various APIs available online in order to provide a performant interface to fulfill that goal.

I believe that the mobile and web application will be a great benefit for students as it will help them discover anything concerning the city such as restaurants, activities, near Ifrane, and public stations. As regarding the ethical implications, the web and mobile application will not harm anyone as it follows the code of ethics.
3. Feasibility Study and Analysis

It is clear that the feasibility study phase plays a unique role in any project because it helps the software engineer to view the project from other perspectives. This phase assists the engineer to see the project from the negative part including all the factors that can affect the project. The following deliverable is the feasibility study of my capstone project ‘IFRANI MOBILE & WEB APPLICATION’.

**Technical Feasibility:**

From a technical point of view, I will be using an open source software called. I chose WordPress because it is more professional and has many features compared to other free platforms. On the other hand, I will be using XML & Java to create the mobile application with the help of Android Studio ($100 yearly vs $25 one time) [1], which it is cheaper compared to IOS and has a greater reputation around the world.

**Economic Feasibility:**

Concerning the cost of the project, the tools that will help this project to be successful will mainly be free. In fact, it will cost $25 as a registration fee in Google play store in order to deploy the mobile application. Concerning the website, the development and the design will be free since I will be using free hosting provider and free domain name. However, the website domain will cost $1.17 as the first time to buy a professional domain from GoDaddy. In total, the project will cost $26.17 which is around 250 Moroccan Dirhams. For the time being, I will use a free domain name to test the website. On the other hand, the development, the design, and the testing of both mobile and web application will take approximately 1 month of working so that I can balance between my courses taken in AUI and my capstone project.

**Market & Social Feasibility:**

The website and the mobile application will add a great benefit for AUI’s international students as it will help them to discover all information about Ifrane city. In fact, I believe that the mobile application essentially will be successful since everybody use smartphones. Concerning the market, there is no application that is similar to IFRANI that exists in Google play store. I believe that my capstone project will be special since there is no tourist guide application that deals with Ifrane city.
4. STEEPLE Analysis

Socio-cultural:

I can say that mobile phones have changed the way people think and live. In fact, they are considered as efficient devices that can make our life easier. Moreover, we use Google map in order to get the right directions when we are lost. Therefore, Ifrani mobile application will add a great benefit for AUI’s international students and tourist as it will help them to discover all information about Ifrane city. On the other hand, Ifrani web application and mobile app will add a great benefit for ministry of Tourism and for the society in general as it will help tourists to discover all information about Ifrane city.

Technological factor:

Since the website is hosted on a free web server, it will be easily accessed as it can be viewed from a laptop, a phone or tablet. Therefore, people don’t need a prior knowledge to access the website as it will be easily accessed via this temporary link address [http://ifrani.ga/](http://ifrani.ga/) and user-friendly. On the other hand, the mobile application is different from the website in term of design, however, the App will be easy to use since the App will be operated for now only in android devices.

Economical factor:

This project is sustainable due to the use of free technologies. The mobile application will be free and it will be available in Google Play Store and it will not have any economic impact. On the other hand, the web application is also free due to open source software that are available online.

Environmental factor:

The mobile and web applications will be in favor of the environment since it will help people to save a lot of time to know about directions, restaurants, activities, and so on. In fact, the project will be environmental-friendly and will save a lot of energy and time for tourists.
Political factor:

The mobile and web application do not represent any political party nor do not adopt any political view and. In fact, the project has nothing to do with politics and will not get engaged into politics.

Legal factor:

The website and the mobile application do not violate any regulations or law. In fact, they are both legal and they do not violate any law in the Moroccan constitution. Moreover, all the resources that are used for the development of this project were open source and they do not violate any legal copyrights.

Ethical factor:

This project will follow the code of ethics. In other words, the web and mobile application won’t harm anyone as we do not collect information about users, and won’t harm the society as whole.
5. REQUIREMENTS SPECIFICATIONS

5.1 Functional Requirements

The project is divided into two parts: a mobile application (Already developed in Software engineering 2 course with Dr. Falah Bouchaib), and a web application that is going implemented using an open-source software (WordPress.org).

In this section, there will be two functional requirements for both the mobile application and the web application. In fact, I had to come up with own functional requirements since I am not working with a client. The diagram below represents the use case diagram in which I represent the main user’s interactions:

![USE CASE DIAGRAM](image-url)
5.1.1 WEB APPLICATION:

1. User Interaction

<table>
<thead>
<tr>
<th>F. Req.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>The user shall view all pages.</td>
</tr>
<tr>
<td>1.2</td>
<td>The user shall comment on pictures, posts, and videos.</td>
</tr>
<tr>
<td>1.3</td>
<td>The user shall view pictures and videos</td>
</tr>
<tr>
<td>1.4</td>
<td>The user shall view the address and location of the desired place.</td>
</tr>
<tr>
<td>1.5</td>
<td>The user shall send feedbacks and suggestions.</td>
</tr>
<tr>
<td>1.6</td>
<td>The user shall make the reservation using reservation form.</td>
</tr>
</tbody>
</table>

Table 1 User Interaction

2. Content Management

<table>
<thead>
<tr>
<th>F. Req.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>The admin shall enter his credential in order to login via the admin page.</td>
</tr>
<tr>
<td>2.2</td>
<td>The admin shall manage the website through WordPress platform.</td>
</tr>
<tr>
<td>2.3</td>
<td>The admin shall add new content editors.</td>
</tr>
<tr>
<td>2.4</td>
<td>The admin shall create new pages.</td>
</tr>
</tbody>
</table>

Table 2 Content Management

3. Updates, Editing and administration

<table>
<thead>
<tr>
<th>F. Req</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>The editor shall update posts</td>
</tr>
<tr>
<td>3.2</td>
<td>The editor shall update videos and pictures.</td>
</tr>
<tr>
<td>3.4</td>
<td>The editor shall edit, update, reply to comments.</td>
</tr>
</tbody>
</table>

Table 3 Updates, Editing, and Administration
3.5 The editor shall create posts.

4. **Navigation and Sitemap**

<table>
<thead>
<tr>
<th>F. Req.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>The web app shall display featured posts page.</td>
</tr>
<tr>
<td>4.2</td>
<td>The web app shall display Top Activities page.</td>
</tr>
<tr>
<td>4.3</td>
<td>The web app shall display Public station page.</td>
</tr>
<tr>
<td>4.4</td>
<td>The web app shall display Top Restaurants page.</td>
</tr>
<tr>
<td>4.5</td>
<td>The web app shall display Near Ifrane page.</td>
</tr>
<tr>
<td>4.6</td>
<td>The user shall use the navigation tabs to see the desired page.</td>
</tr>
<tr>
<td>4.7</td>
<td>The web app shall present a page about IFRANI.</td>
</tr>
<tr>
<td>4.8</td>
<td>The web app shall display a slideshow of recent posts.</td>
</tr>
</tbody>
</table>

*Table 4 Navigation and Sitemap*

5. **Editor interface**

<table>
<thead>
<tr>
<th>F. Req</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>The interface shall present an admin page.</td>
</tr>
<tr>
<td>5.2</td>
<td>The interface shall allow to add post</td>
</tr>
<tr>
<td>5.3</td>
<td>The interface shall allow to create pages.</td>
</tr>
<tr>
<td>5.4</td>
<td>The interface shall allow to manage comments.</td>
</tr>
<tr>
<td>5.5</td>
<td>The interface shall provide major tools for appearance.</td>
</tr>
<tr>
<td>5.6</td>
<td>The interface shall allow to manage accounts.</td>
</tr>
<tr>
<td>5.7</td>
<td>The interface shall allow to add videos, pictures, and texts.</td>
</tr>
</tbody>
</table>

*Table 5 Editor Interface*
6. **Website Statics:**

<table>
<thead>
<tr>
<th>F. Req.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>The website shall track the number of comments.</td>
</tr>
<tr>
<td>6.2</td>
<td>The website shall track the number of visitors daily.</td>
</tr>
</tbody>
</table>

*Table 6 Website Statics*

7. **Accessibility**

<table>
<thead>
<tr>
<th>F. Req.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>The website shall be displayed on laptop.</td>
</tr>
<tr>
<td>7.2</td>
<td>The website shall be displayed on tablet.</td>
</tr>
<tr>
<td>7.3</td>
<td>The website shall be displayed on mobile.</td>
</tr>
</tbody>
</table>

*Table 7 Accessibility*

8. **SEO**

<table>
<thead>
<tr>
<th>F. Req.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>The website shall be visible on most of Search engines.</td>
</tr>
</tbody>
</table>

*Table 8 SEO*

9. **Security**

<table>
<thead>
<tr>
<th>F. Req</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>The web app shall preserve the confidentiality of the user.</td>
</tr>
<tr>
<td>9.2</td>
<td>The web app shall preserve the confidentiality of editors (IFRANI).</td>
</tr>
<tr>
<td>9.3</td>
<td>The web app shall preserve the confidentiality of the Admin (IFRANI).</td>
</tr>
</tbody>
</table>

*Table 9 Security*
10. **Hosting**

<table>
<thead>
<tr>
<th>F. Req</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>The web app shall be hosted in a web-server (Free)</td>
</tr>
<tr>
<td>10.2</td>
<td>The web app shall have its own link.</td>
</tr>
<tr>
<td>10.3</td>
<td>The website shall be linked to free domain name (ifrani.ga)</td>
</tr>
<tr>
<td>10.4</td>
<td>The website shall have its own professional domain.</td>
</tr>
</tbody>
</table>

*Table 10 Hosting*

### 5.1.2 MOBILE APPLICATION

The mobile app home screen contains posts that are divided into 4 main categories:

- Top Activities
- Top Restaurants
- Public Stations
- Near Ifrane

I had to think for my own requirements due to the fact that I am not working with a client on this project. However, based on what I must achieve in this project, I came up with the following list of functional requirements:

- User have the ability to select the desired category.
- User can see posts based on the desired category.
- User have the ability to see the address for the desired place.
- User can see ‘Top activities’ in Ifrane.
- User can see ‘Public Station’ in Ifrane.
- User can see in Ifrane.
- User can see Top activities in Ifrane.

The mobile and web application satisfy a number of nonfunctional requirements. The list below show in details the nonfunctional requirements that I achieved.
5.2 Non-Functional Requirements

Usability requirements

The mobile and web app are easy to navigate and user-friendly. In general, the use experience must be enjoyable since both interfaces are easy to use and pleasing to the eye. They will be entirely in English since the project is targeting tourists and English language is considered as universal language.

Availability requirements

Both applications must be always available for use when one is connected to the internet. In case of maintenance, it will be announced.

Performance requirements

Since the mobile app was developed using Android studio, it will guarantee high performance, responsiveness, and fast processing time. Concerning the web application, an upgrade of the hosting service must be done in order to guarantee a high performance.
**Maintainability requirements**

Both applications must be maintainable in order to fix errors and allow for upgrades through Google play store.

**Scalability requirements**

Both applications must allow for growth and scalability without affecting the reliability and performance of both applications.

**Security requirements**

Both applications should protect the information that deals with users, editors, and admin.

**Extensibility requirements:**

Both applications should be extensible. In other words, they must allow for adding new features and allow for updates. On the other hand, both applications.

**Ethical requirements:**

The mobile and web applications should respect all the academic and ethical standards.

**Reliability requirements**

Both applications should be reliable. Users will have an enjoyable experience while using the applications by insuring an experience without bugs and errors.
6. Project Design

Concerning object-oriented programming, the design step is maybe the most significant stage during the development of applications. It is in the plan step that we choose how to separate the activities of our program into classes, when we choose how these classes will collaborate, what information each will store, and what activities each will perform. In reality, one of the principle challenges that starting software engineers face is choosing what classes to characterize to take every necessary step of their program.

In this section, I will divide the project design phase into two sections as I used different technologies for designing both mobile and web applications:

6.1 Mobile application:
   6.1.1 Technological enablers
   Concerning the mobile application, I used Android studio as the main technology for the implementation of the mobile application. I used it for the graphical user interface and for the front end. Concerning the main database management system, I did not choose any since the mobile app is just an application that shows the main activities to do in Ifrane. The mobile app does not require any credentials from the users.

   6.1.2 Language used
   Concerning this project, the main programming was Java programming language as it is considered as the official language of Android development. It was chosen because I used it in different projects I worked on and most familiar with. Also, I used XML files for the design of the user interface.

   6.1.3 Front End
   As I said before, I chose Android Studio as the main IDE. I chose it due to the fact that is the official IDE (integrated development environment) for Google’s Android operating system. It was specially designed for Android development. By using IDE, the implementation process will be faster. As a matter of fact, I do not have experience in the mobile application development,
however, I can say that Android Studio is a simple interface that make the development of applications easier.

**6.1.4 System Architecture**

A system architecture is a conceptual model that describes the general behavior of the system, the structure, and the organization. In fact, it shows the main aspects of the system, their interaction, and their relationships between them. Concerning the mobile application, the system will be composed of two components: The mobile application and the user. User can access different posts about different categories that will after be redirected to another page in which it will show the specific location about a certain place. Concerning the web application, the system is composed of three main components which are the user, the web application, and the server that will include the MySQL database and PHP files. In fact, the user can access different features of the system through accessing Ifrani’s website. Moreover, when the user chose a certain functionality, the web application will send an HTTP request to WordPress in which it will process the request by running the PHP files that are located in 000webhost which is the server, and in the same time checking the MYSQL database. The following figure illustrate the system architecture of the whole project.
6.1.5 Diagrams

- **Class Diagram**

- **Use Case Diagram**
6.2 Web Application:

6.2.1 Technological enablers

Concerning the web application, I used WordPress, which is a free open-source software that give you the ability to create and build beautiful websites. It is well known that WordPress has made or generated many professional websites for many big name brands such as NASA, BBC America, CNN, Microsoft, and many well-known brands. Therefore, WordPress has been the best Content Management System available. On the other hand, I used 000webhost to host my website without paying nothing. It is actually a free host and provides free users with 1.5GB of free disk space [2]. The following items are the main features of 000webhost:

- It’s completely free.
- It provides free users with 1.5GB of free disk space.
- PHP with MySQL support.
- cPanel Control.

I used also FileZilla- The free FTP solution, which is an open source FTP client that is available for Windows, Mac OS X and Linux. FileZilla is considered as a tool or a way to download and upload files between my web server and my local system. Therefore, I used this free software to manage my web application by downloading files and uploading the theme I used for the web application.

6.2.2 Languages used

CSS: It stands for Cascading Style Sheets. It describes how HTML elements are to be displayed. HTML is used to define things like paragraphs, headlines, and allows for embedding videos, images, and other media. It is considered as an important part of any website. The following snapshot show a slight modification in the design I made in the CSS code that deals with comments:
HTML: WordPress, PHP, and HTML work together. After getting familiar with WordPress platform, I managed to do some slight modification in terms of colors in the theme using CSS.

6.2.3 Plugins

A plugin is a piece of software that is integrated to WordPress which contains a group of functions that can be added to WordPress. Functionalities such as customizing the page, change the design, add widgets, and so on. In fact, most of plugins are written in PHP and they are integrated seamlessly with WordPress. I used many plugins in order to make the website user-friendly and attractive. The following snapshot is an example of plugin used in my website:

Figure 4 WS Facebook Like Box Widget

The following list are some of the plugins I used in order to make the website user-friendly and attractive in details:
• Form Maker: I used this plugin to make the reservation form for the users who want to make a reservation in certain hotel or restaurants. This plugin is user friendly and intuitive. It makes the process of creating forms fast, easy, and will allow the users to be far from programming and scripting to create WordPress Forms.

![Reservation Form](image)

*Figure 5 Form Maker*

• Under Construction: this plugin enables a page to be shown while the website is under construction in future. It puts the website behind a great maintenance mode, coming soon, landing page, or under construction. If for instance someone try to visit the website while it is under construction, the following page will be displayed:
- Akismet Anti-Spam: This plugin protects the website from spam. It is an algorithm that automatically checks all comments and delete the ones that look like spam.

6.2.4 Theme:

In general, theme is a collection of files and stylesheets that are used to define the appearance and make up a graphical interface. We can change and control this appearance (the skin of the website), however, we must be careful about the whole vision of the website. As a matter of fact, we can find in customized template files such as style sheets (.css) and other code files (.php).
7. DEVELOPMENT AND IMPLEMENTATION

7.1 Web Application
7.1.1 The process of creating the website

The first thing I did during the development of the web application is looking for a free web hosting services in the net. I have found a free web hosting service which is 000webhost. After doing many researches, I started to get familiar with 000webhost platform and be able to host my website. As I said before, 000webhost is a free host and provides free users with 1.5GB of free disk space. The following items are the main features of 000webhost:

- It’s completely free.
- It provides free users with 1.5GB of free disk space.
- PHP with MySQL support.
- cPanel Control.

I downloaded WordPress 5.1.1 from the official website of WordPress and made some modification in terms of the base configuration in wp-config.php file using the following settings [3].
The following modifications were made in wp-config.php file by changing the settings with my server credentials:

After I get familiar with 000webhost platform, I started to build the website by installing an open source software (WordPress) with updating the settings in the server. I used FileZilla to upload the template and I used the following credentials in order to connect my laptop to 000webhost server:

![FTP Details](image)

**FTP details**

Use these details to access and manage your website files.

Warning: Disabling this feature will disable Web File Manager!

**FTP Transfer**

- **ON** (on)

**Host Name:** files.000webhost.com

**Port:** 21

**Username:** ifrani

**Password:** same as your website password

![WordPress Configuration](image)
The following snapshot shows the process of uploading the template to the 000webhost server:

![FileZilla](image)

**Figure 11 FileZilla**

After uploading the template, the next step was to look for a domain provider company. Domain name is basically the website name. In other words, it is the address or link where users can access my website. In fact, I found a company that provide free professional domain names. The following snapshot shows the available free professional domain names:

![Freenom](image)

**Figure 12 Freenom**
This company provide customers with free professional domain names for 12 months with the ability to change the domain name to the ones that are known by internet users:

**Figure 13 Domain Names**

In fact, I chose ifrani.ga as a domain name in order for the user to access my website. The domain name will be active for 12 months and after that I will change the domain name to .com domain from GoDaddy which is an American company that is specializes in the management of domain names on the internet. The following snapshot show the domain name I chose for my website with registration and expiry date:

**Figure 14 Domain information**

After choosing the domain name, the following step was to link the address provided by 000webhost which is [https://ifrani.000webhostapp.com/](https://ifrani.000webhostapp.com/) with [http://ifrani.ga/](http://ifrani.ga/). What I did is that I used custom name servers rather than default name server provided by Freenom. In fact, by default, any website that is hosted in 000webhost can only be accessible via its domain. It has the following form [websitename].000webhost.com. The only recommended method to change the website address is by configuring my domain’s DNS provider to 000webhost name servers which are shown in the following snapshot:
I moved after that to 000webhost platform to link my domain name with 000webhost domain name. I added my domain name and the system checked my domain name if it is pointed to correct name servers. The following snapshot show that my domain name was successfully linked to 000webhost domain:

<table>
<thead>
<tr>
<th>Domain</th>
<th>ifrani.ga</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Parked</td>
</tr>
<tr>
<td>Linked</td>
<td>ifrani.000webhostapp.com</td>
</tr>
</tbody>
</table>

Figure 15 Nameservers

Figure 16 Domain link
7.1.1.1 WordPress Dashboard

After installing WordPress software on my hosting service, link my domain name with 000webhost domain, I moved to the admin page where I can access the website building platform. In fact, I spent many days learning the main features of the dashboard, how to make modifications in the design, and how to deal with plugins. The following snapshot shows the dashboard page and all the components of the interface are at the left side:

![WordPress Dashboard](image)

*Figure 17 WordPress Dashboard*

The first thing I did after accessing the dashboard, I started making some modifications in the design of the website. In general, WordPress theme are made up of PHP files that contain template tags, PHP code, and a mixture of HTML. The following snapshot shows the theme editor where you can customize the website through CSS in the .php files:
As I said before, I used many plugins in order to make the website user friendly and attractive. The one that I liked the most was Form maker. I used this plugin to make the reservation form for the users who want to make a reservation in certain hotel or restaurants. As you can see in the following snapshot, the Custom Text in Email for User allows you to send confirmation email to the user after making the reservation based on the email provided by the user in the reservation form:
As you can see in the above snapshot, this plugin uses basic HTML and custom content for the process of sending the confirmation email. The following snapshot show the reservation and the email confirmation that is sent automatically to the user email after making the reservation:

**Figure 20 Reservation**

![Reservation Form](image)

**Figure 21 Email Confirmation**

![Email Confirmation](image)
The second thing I used in order to make some slight modifications in Site Identity, Colors, Menus, and Widgets. In the dashboard menu, there is an option in which you can make modification in the design and the content of the home page by going to Customize. In the theme editor, the admin will have the ability customize plugins and themes directly. Depending on the plugins you have installed and the theme you are using. After accessing the Customizer, this is what you will see:

As you can see on the right-hand side, this is a preview of the website as it changes whenever you made a modification. It changes as many times as you make any modification in the left sidebar.

After finishing with the design and implementation phases, I started posting posts in Top Activities, Top Restaurants, Near Ifrane, and public stations. After finishing with writing posts, I started searching in the net on how to include the location of each place using google map. The easiest way to do so was by adding a new HTML block and use the following embed code:
Forest Restaurant

Friendly family restaurant in the heart of Ifrane. The staff is caring and the little care, the menu is varied and the food is good (salad, pizza, sandwich). Nice terrace

Figure 23 Embed code

7.1.1.2 Web Application screenshots
The following screenshot shows the front page of the website:

Figure 24 Front Page ScreenShot
After accessing the website, the visitor will have the ability to use the menu to check the desired tab. After the menu, the user can find featured posts that are displayed in a slide show. Also, the visitor can see different posts in different categories that are displayed in the following snapshot:

Figure 25 Website ScreenShot

In each post, the visitor can see a description and the location of the desired place. The following snapshot shows an example of a post:

Forest Restaurant

By admin in Top Restaurants 31st March 2019

Friendly family restaurant in the heart of Imlil. The staff is caring and the little care, the menu is varied and the food is good (salad, pizza, sandwich). Nice terrace.

Tags: Top Restaurants

4. Arnoldi, Deli

Foodie →
If the visitor wants to search for a certain place, he/she can use the widget that is located in the main sidebar in the front page:

![Search Location](image)

_**Figure 26 Search Location**_

### 7.2 Mobile Application

#### 7.2.1 The process of creating the mobile application

The implementation of the mobile application was previously implemented during Software Engineering 2 class. Before I started developing the mobile application, I started watching some tutorials on how to use Android Studio in order to develop a simple mobile application. I learned many new concepts while watching the tutorials such as Activities, Fragments, Intents, Widgets, and so on. In fact, the implementation started by designing activities, which are used to initiate a program. An Activity is basically used for interaction with the user and we can find one special Activity that is launched when we run our application, and it is called the Main Activity. According to Android Developers, an Activity in Android Studio is defined as a screen or a graphical user interface that we used in order to design the app. In other words, it is an XML file that have many graphic elements such as Widgets, Buttons, Text, and others that are shown in the following snapshot:
As I said before, the main activity is basically the first screen that when the user launches the app, it is the first screen to appear. In fact, an Activity have the ability to start another activity so that we can perform multiple actions. However, all the information about these Activities must be registered in an XML file called AndroidManifest. This file contains information such as activities, classes, permissions and content providers. The following snapshot shows the code for AndroidManifest:

```xml
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    package="com.example.android_image">
    <application>
        <activity android:name="AttractionListActivity"
            android:parentActivityName="MainActivity" />
        <activity android:name="AttractionActivity" />
        <activity android:name="MainActivity" />
    </application>
</manifest>
```

*Figure 28 Android Manifest*
The front page of the mobile application shows a list of different sections that are displayed as a RecyclerView. This widget is more flexible and advanced version of ListView. The idea of using RecyclerView widget was basically to display the content of the mobile application in a vertically-scrollable collection of views [4]. RecyclerView can be used in order to display long lists of items. In fact, each sections that are chosen by me to be displayed in the front page are positioned in vertical order. The following snapshot shows the code of the front page from the MainActivity:

![Figure 29 Main Activity](image)

Java class must extend the Activity Manager in order to become an activity. In my case, it extends the AppCompatActivity. According to Android Developers, AppCompatActivity is the base class for activities that basically use the support library action bar features [5].

After watching some tutorials on YouTube, I understand that the first step to do after extending the java class the activity manager, the next step is to override the function onCreate(). We must override it because when the application is launched, it is the first method to be executed. As you can see in the following snapshot, the function SetContentView displayed the Layout that I created before through XML:

```java
public class MainActivity extends AppCompatActivity {

@Override
protected void onCreate(@Nullable Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);
}
```

![Figure 30 onCreate()](image)

The following snapshot show the whole code for the MainActivity with a brief description of each part of the code:
Figure 31 Main Activity Source Code

I created a section container in which the user has the ability to see posts according to their categories. As you can see in the following snapshot, the XML file is composed of graphical elements such as Show All Button, Text Views, and RecyclerView in which the posts will be displayed in horizontal form:

```java
public class MainActivity extends AppCompatActivity {

@Override
protected void onCreate(@Nullable Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_main);

    // Initialise list to store collection of attractions
    AttractionRepository repository = AttractionRepository.getInstance(this);
    List<AttractionCollection> collections = repository.getAttractionCollections();

    // Hook the recycler view
    RecyclerView recyclerView = findViewById(R.id.main_recycler_view);

    // Set fixed size true and optimize recycler view performance
    recyclerView.setHasFixedSize(true);

    // The data container has fixed number of attractions and not infinite list
    recyclerView.setLayoutManager(new LinearLayoutManager(this, LinearLayoutManager.VERTICAL, false));

    // Attach adapter to the RecyclerView widget which is connected to a layout manager
    MasterAdapter collectionAdapter = new MasterAdapter(view, context, collections);
    recyclerView.setAdapter(collectionAdapter);
}
```
CardView is a container in order to display the posts in the section container in which the user can scroll the posts:

![Figure 32 Section Container](image)

![Figure 33 Card View](image)
I used another item from the palette which is list_item_row. It was created in order to display all the posts in list format after the user click on Show all. The following snapshot shows the design phase:

![List Item Row](image)

*Figure 34 List Item Row*

The following snapshot shows another Layout after the user click on a certain post. It includes the image of the desired place, short description about the place, and show in map button in order to see the location of the desired place:
In every Android project structure, there are two main folders that contribute to the project. We have the `res` in which all the XML files are located there and we have the `JAVA` folder in which we store all the source code. We have another folder named `values` that consist of four XML files according to my mobile app. The following snapshot shows the values file:

- Colors.xml contains the code for all the colors I used in my project.
• Dimens.xml carries the code for dimension value.

```
<resources>
  <dimen name="vertical_margin">8dp</dimen>
  <dimen name="horizontal_margin">8dp</dimen>
  <dimen name="detailed_text">16sp</dimen>
  <dimen name="section_title_text">16sp</dimen>
  <dimen name="attraction_card_horizontal_margin">5dp</dimen>
  <dimen name="attraction_card_image_view_width">300dp</dimen>
  <dimen name="attraction_card_image_view_height">150dp</dimen>
  <dimen name="attraction_card_attraction_title_text_size">16sp</dimen>
  <dimen name="attraction_card_brief_desc_text_size">12sp</dimen>
  <dimen name="list_item_height">88dp</dimen>
  <dimen name="collection_title_horizontal_padding">4dp</dimen>
  <dimen name="activity_collection_container_height">258dp</dimen>
</resources>
```

*Figure 38 Dimens.xml*

• Strings.xml contains text strings for my application and each string has a unique id.

```
<resources>
  <string name="app_name">frank</string>
  <string name="show_all">Show All</string>
  <string name="my_prairie_park">My Prairie Park</string>
  <string name="michifon_prairie_park">Michifon Prairie Park</string>
  <string name="area_prairie_park">Area Prairie Park</string>
  <string name="la_source_york">LA Source York</string>
  <string name="la_park">LA PARK</string>
  <string name="area_park">Area Park</string>
  <string name="forest_preserve">Forest Preserve</string>
  <string name="foodie">Foodie</string>
  <string name="chile">Chile</string>
  <string name="baja">Baja</string>
  <string name="cafe">Cafe</string>
  <string name="chinese">Chinese</string>
  <string name="el_harco">El Harco</string>
  <string name="chile_el_horco">The Chiles El Horco</string>
  <string name="creve_cerise_park">Creve Nasket Park</string>
  <string name="next_station">Next station</string>
  <string name="future_center">Future Center</string>
  <string name="top_activities">Top Activities</string>
  <string name="france_limo">France Limo</string>
  <string name="fishing_limo">Fishing Limo</string>
  <string name="fishing_center">Fishing Center</string>
</resources>
```

*Figure 39 Strings.xml*

The following map query strings is located in the strings.xml file which the purpose from it is to link the place name id with its location in google map using longitude and latitude coordinates:
• Styles.xml enables us to separate the details of the design of the app from UI behavior.

```xml
<resources>
  <style name="AppTheme" parent="Theme.AppCompat.Light.DarkActionBar">
    <item name="colorPrimary">@color/colorPrimary</item>
    <item name="colorPrimaryDark">@color/colorPrimaryDark</item>
    <item name="colorAccent">@color/colorAccent</item>
  </style>
</resources>
```

Figure 41 Styles.xml

• Concerning the pictures, they are all located in the drawable folder and each picture has it unique id.

The following method reduces the size of the image to efficiently load images:

```java
private static int calculateInSampleSize(BitmapFactory.Options options, int reqWidth, int reqHeight) {
    float srcWidth = options.outWidth;
    float srcHeight = options.outHeight;
    int inSampleSize = 1;

    if (srcHeight > reqHeight || srcWidth > reqWidth) {
        float widthScale = srcWidth / 2;
        float heightScale = srcHeight / 2;
        inSampleSize = Math.round(heightScale > widthScale ? heightScale : widthScale);
    }

    return inSampleSize;
}
```

Figure 42 calculateInSampleSize method

This method gets the scaling factor from the calculateInSampleSize method and scales the image properly to present an overall nicer looking image:
static Bitmap decodeSampledBitmapFromResource(Resources res, int resId, int viewType) {
    int imageWidth = 0;
    int imageHeight = 0;
    switch (viewType) {
        case SingleAttractionListAdapter.CARD_ITEM_IMAGE_DECIDE:
            imageWidth = (int) TypedValue.applyDimension(
                TypedValue.COMPLEX_UNIT_DIP,
                300,
                res.getDisplayMetrics());
            imageHeight = (int) TypedValue.applyDimension(
                TypedValue.COMPLEX_UNIT_DIP,
                150,
                res.getDisplayMetrics());
            break;
        case AttractionListAdapter.LIST_ITEM_IMAGE_DECIDE:
            imageWidth = imageHeight =
                (int) TypedValue.applyDimension(
                    TypedValue.COMPLEX_UNIT_DIP,
                    88,
                    res.getDisplayMetrics());
            break;
        default:
            break;
    }
}

res.getDisplayMetrics();

default:
    break;

BitmapFactory.Options options = new BitmapFactory.Options();
options.inJustDecodeBounds = true;
inSampleSize = calculateInSampleSize(options, imageWidth, imageHeight);
options = new BitmapFactory.Options();
options.inSampleSize = inSampleSize;
return BitmapFactory.decodeResource(res, resId, options);
7.2.2 Screenshots of the mobile app

As you can see in the following pictures, this the first page where the user sees first after launching the application:

![Mobile Application Screenshots 1](image)

Figure 44 Mobile Application Screenshots 1

When the user first launches the application, they will see four slideshows named: Top Activities, Top Restaurants, Near Ifrane, and Public Station. He can either scroll left to see different places or by clicking on Show all button to see all places. After that, the user can select the desired place and check the post where he can find a live picture of the desired place, short description of the place, and Show in Map button where the user will be redirected to the location of the place in Google Map.
Figure 45 Mobile Application ScreenShots 2
8. TESTING

In general, testing is a procedure in which we test the product with the aim of finding bugs. In fact, the process of testing the product must meet the customer requirements and it follows the pareto rules which states that about 80% of bugs came from 20% of program components.

8.1 Software Testing Levels

8.1.1 Unit Testing
This is a level of software testing process in which it is performed by developers in order to make sure that the code is meeting the user specifications and is working fine. In fact, the purpose behind this testing process is to check that each unit of the software fulfill the user specifications and before integrating them into modules, each unit is tested separately.

8.1.2 Integration Testing
This is a level of software testing where we combine all the individual units and test them as a group in multiple ways. The purpose behind this test is to detect faults in the interaction between integrated units.

8.1.3 System Testing
This is a level of software testing in which the testers test the entire system behavior with taking into consideration the requirements and scenarios. In fact, system testing may be performed before system integration or in parallel. The main objective behind this testing level process is to test the entire system in order to evaluate the system’s compliance with the user specifications and requirements.

8.1.4 Acceptance Testing
This is a level of software testing in which we make sure that the software is working correctly and it is tested for acceptability. Alpha testing is a type of acceptance testing in which we distinguish all the possible bugs before launching the product to the end user. In fact, I had to test both the web application and the mobile application with Dr. Falah Bouchaib in his office. The testing phase for both application was done throughout the development of the project.

I faced some difficulties concerning the testing of the mobile application since I could not launch the application from my phone. What I did is that I had to create a virtual device in Android Studio to run the application.
9. CONCLUSION AND FUTURE PERSPECTIVES

It is clear that the mobile application needs a lot of works in order to deploy it to Google Play Store and launch it to the market. However, working on this capstone project has gave me the opportunity to learn more about creating mobile and web applications. The main idea behind this capstone project is to guide, facilitate, and provide tourists and international students of Al Akhawayn University with any information concerning Ifrane city.

During the development of this project, I faced many difficulties especially in the development of the mobile application since I do not have any experience toward it. However, it was a great learning experience and I hope somehow it will contribute to the Moroccan society as whole and add a great benefit for AUI’s international students and tourists.

As future project, I will upgrade the features of the hosting services and the domain name for the web application. I will do my best to cover and add all the main activities that people can do in Ifrane city. On the other hand, I will also work on the mobile application as it needs a lot of works as there will be a possibility to develop the IOS version of my application.
10. REFERENCES

[3]: API WordPress: http://api.wordpress.org/secret-key/1.1/salt/