Step Tracker Individual Application Report

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*Abstract*— Step Tracker is an android application that provides the user to track and display the number of daily steps, calories consumed, and total distance travelled by using the Google APIs. Step Tracker has been integrated with the five days weather forecast feature where it uses the global positioning system module to fetch the current location temperature. The report also focuses on the differences between the traditional web applications and mobile applications, business models for the mobile applications.

Keywords— Mobile application, Desktop applications, Google API, Weather forecast, Step Tracker, Temperature

# **Introduction**

Mobile applications have become an important part of our daily life. Using mobile applications, users changed the way to communicate and interact with people through digital mode. With the increase of global pandemic issues, the usage of mobiles was tremendously increased due to the migration of traditional education platforms to digitalized learning modes such as Edu comp, smart tablets, Byjus learning apps.

**II MOBILE APPLICATIONS**

A mobile application or mobile app is a software program that is designed to work on any mobile device like a Cellular phone, tablet or a smartwatch, etc.., Applications or Apps were originally intended to provide assistance for writing an email or setting up a calendar or to establish a contact database for any user. This caused a huge public demand for apps which caused this rapid expansion into various areas like mobile games, factory automation, GPS, and other location-based services, etc. These applications can be installed by downloading them from the Application distribution platforms which are usually operated by mobile operating systems. These mobile operating systems differ based on the type of Mobile device the user has.

The major mobile operating systems are the App Store of IOS mobile users and the Google play store for Android mobile users. these applications provided by their parent mobile operating systems can be installed for free or they can be priced accordingly by the developer of that particular application. Mobile applications are always a contrast for desktop applications which are designed to run on desktop’s and laptop’s or web applications which can be run on a mobile web browser rather than a mobile device

As smartphones became a part of our life to the point they are inseparable from our daily life. We use our smartphones for waking up using a morning alarm or checking feed on Facebook, Instagram, or Twitter and to have a friendly chat on WhatsApp or taking a snap on Snapchat or trending in TikTok and entertain by watching YouTube, adjusting the thermostat, or adjusting your room lighting and controlling your Television or your air-conditioner and the list goes on. There are various applications for various uses these mutually exclusive applications run independently from each other on the same main operating platform.

These mobile applications are of various types but they are typically divided into three types they are:

1. Native mobile application

2. Hybrid mobile application

3. Web-based application

***Native mobile apps:***

Native mobile apps are designed to be “native” to one platform, whether it’s Apple iOS, Google’s Android, or Windows Phone. The native platform can be advantageous because it tends to optimize the user experience. Because it was developed specifically for the platform, it can operate more quickly and intuitively.

***Hybrid mobile apps:***

These apps can be installed on devices just like native apps, but they run through web browsers. All hybrid apps are developed through the HTML5 programming language. Though hybrid apps are not as fast or reliable as native apps, they have a greater capacity for streamlining the development process. Because you don’t have to build and maintain apps for separate platforms, your business can save time and resources. It’s ideal for apps that primarily deliver content.

***Web apps*:**

Responsive websites switch to a different design when they are accessed from a mobile device. Adaptive web applications, on the other hand, scale to fit the different screen sizes of mobile devices. For these apps, the design doesn’t change. Web apps are built using the most popular programming languages, but they can’t use hardware on mobile devices or be sold in any app store.

# **Challenges faced during mobile application development**

1. The first challenge that I faced as a beginner in mobile application development is choosing an innovative project idea. Initially, we thought to go for a fresh idea. Rather we preferred a simple mobile application. So, we finally went for a fitness app called “Step tracker”. The target audience is fitness freaks. So to satisfy the end-users is quite challenging. According to my, it is similar to both traditional web apps and mobile apps.
2. The challenges keep emerging after selecting the type of mobile application for the idea. As discussed above there are four types of mobile applications. Every type of application has its pros and cons. Native applications have all those features which match our idea. Also increasing UX and the response time, speed, etc.
3. After choosing the project idea the biggest challenge was to select a suitable programming language. Initially, we thought to develop this application using java. Later we thought to develop which is compatible with both android and iOS devices. Software architecture is certainly a common challenge for every project. The developer must understand the architecture which is helpful during implementation or else it may lead to confusion and not result in the desired output.
4. We should make sure that the features used in our app must work for all android and iOS users. Due to this, the app loses its control, and finally, the application gets crashed.
5. The next challenge is to have UI design the same in all android iOS platforms where the same logic function should be implemented at the back end side of the code. At the initial stages, I have used padding functionality. Later I realized padding gives a specification that android type. So to overcome this problem I have used media query which is a universal package that helps to align the design layouts.
6. Using firebase[1] as the back end for login, and daily step count was the toughest challenge of all. Also signing up the authorization credentials with the help of google access tokens was time-consuming. Registering all the users of Google and Facebook into the firebase server was one of the challenging issues.
7. Sending scheduled periodic notifications remotely from firebase to the app using the firebase cloud messaging module was challenging.
8. At first, I have used dynamic weather icons in the weather screen user interface layout. After configuring all the UI layouts to their respective background task, I compiled it, and running it showed an error named no tree shaking icons which mean that the UI interface does not support dynamic icons. So, to replace dynamic icons, I have used my local storage to save all the weather codes of their respective weather symbol.
9. I have used the image picker module to add a display picture to a profile that imports images from the gallery. Initially, it resulted in errors for not requesting permissions from the user to import images from the gallery. The issue was resolved and was quite a challenging one.
10. At first, the login credentials are stores in the form of different document collections. There was no issue in uploading documents from the app to the firebase. But I had to reduce read and write operations to fetch data from the firebase.
11. When I was integrating Google APIs into my app platform, I was not able to fetch data from Google API. The reason was not requesting permissions for physical activity recognition and location permissions. To overcome this issue, I have used the permission handler module to request permission from the user.
12. We have used open weather API for displaying 5 days weather forecast including the present day. The glitches I faced during this process were, google API sends weather details every 3 hours. So totally for 5 days, it shows 40 different weather variations. We must pick only 5 from those which is selecting one weather item from each set.
13. Keeping users logged in throughout the lifecycle was one of the challenging tasks.
14. Opportunities
15. In Step Tracker I have used a GPS sensor to fetch the current location in the form of longitudes and latitudes such that it displays the current weather information and including the five days weather forecast with just one tap on the weather icon.
16. Users are provided with different fitness measurements such as distance calculators, calories consumed, daily step count, the total number of steps taken, pedestrian status icon, and statistics to display the number of steps taken in the week.
17. Mobile applications are convertible to a mobile website. The advantage of using it is, increases speed when coming to searching and downloading on our device resulting in quicker browsing than an app.
18. Pedometer and Pedestrian status sensors are used to monitor the activity levels of the user.
19. This step tracker is set by default in dark theme mode to reduce the power consumption of the battery.

***Mobile vs Web apps:***

***Native App:***

Native apps are those which are directly installed in our smartphone. Native apps may or may not require internet connectivity. The apps are installed from either google play store or Apple’s app store. Native apps are platform-dependent. They work much faster than web apps. We can also add gestures to the app. Gestures are of two types, standard, and app-defined gestures. The development cost for native apps is of higher cost and development time is around 90 days.

Native apps can be developed with many programming languages like for android we use java, Objective-C for iOS, and visual c++ for windows mobile.

Native apps consist of built-in sensors which reduce our time to inject into them. The only disadvantage of using native apps is that all touch-based gestures are present in an app. Native apps have the capability of adjusting different screen sizes. But to embed all features into a native app depends on the UI design and workflow between the activities. Native apps have greater functionality when compared to web apps. Security risks can be mitigated to a maximum extent. It is easier to build as many development platforms are provided for us.

The cons of using native apps are that they require high maintenance costs when compared to web apps. To deploy an app into the app store or play store there are certain guidelines to be followed. To deploy an app into Playstore

The guidelines are not so strict whereas in Apple’s app store the guidelines are strict.

***Web Apps:***

Web Applications or commonly known as Web App’s are not applications. They are the websites that only look and feel like an application, but they are not used as such. These Web Applications are run by a browser and are usually run by HTML codes. These applications are available to users usually for free in some cases for a price and these enable the users to access them as a web page. These applications navigate the user to a specified URL and then they have an option of installing these applications to their home screen link linking a bookmark of a web page. As of today, more sites use HTML5 for generating this application so that the distinctive features of web pages and web applications are hazed. These web applications either require Internet access or cellular access for running and the operating speed of the application depends on the speed of the network they are connected to.

The advantages of using web apps are they need not be downloaded or to be installed. Web apps are easier to maintain. Web apps are updated by themselves. The maintenance cost for web apps is low compared to mobile apps. They do not require approvals from the app or play store.

The disadvantages of using web apps are they need an active internet connection. The servers may face issues that lead to slower functionality than mobile apps. Web apps have security risks.

**Section II**

1. ***How was the process of developing the mobile application different from the traditional application development?***

* Traditional web applications usually have a larger screen size when compared to mobile applications. Because of the larger screen size, the components can be easily allocated to a website. In mobile applications, it depends on the UI design and the workflow between activities.
* We have opted for firebase as back-end server storage for our application. Whereas if go for MongoDB then the database has to be created from scratch which is time-consuming. In web apps since it requires larger database storage developers opt for MongoDB, SQL, Hive, etc.
* We must keep track of the speed of the application because mobile apps fetch data from the local storage as well as from the server-side to maintain applications’ lifecycle.
* All mouse clicks are recognizable in web apps. This is not the case in mobile apps. An only a limited number of touch gestures are recognized.

1. ***You were asked to make a rather detailed and visual UI-design before implementing it. Was it helpful during development? Was it ‘worth’ it – would you do it in another project?***

Yes, the UI design was really helpful. It helped me to understand the navigation between the different fragments of mobile activities. This was a foundation tool to develop a static user interface in the mobile application. This UI layout helped me to understand the back-end functional activities. Yes, I would use it in another project to provide a higher version that provides google maps timeline tracking activity of the user. Using UI design some parts of the job will be completed. With the help of the UI editor, some of the user interface elements were reused in mobile application development.

1. ***What was working well and not working well during the development of the application from the perspectives of processes, people & collaboration, and tools?***

### **Process:**

* Multiple access logins were working effectively as per the expectations.
* Pedometer sensors monitor the physical activity of the user.[2]
* It calculates different fitness measurements like distance travelled, calories burnt, daily step count, total number of steps taken, pedestrian status icon, and statistics to display the number of steps in the week.
* Current location coordinates are automatically fetched in the form of latitudes and longitudes to display 5 consecutive days weather forecast with just one tap on the weather icon in the bottom navigation bar. Current location coordinates are automatically fetched in the form of latitudes and longitudes.
* The calendar is working in static mode only. Daily events were not added to the calendar due to the concise timeframe.
* Touch listening gestures are not added to the application.

### **People & Collaboration:**

* There was constant support from my teammates in all aspects to develop this application.
* Regular zoom meetings were held, and deadlines were added to every task to avoid delay.
* Brainstorm sessions were held in discussing the opinion of the UI layouts.

### **Tools:**

* I have used dart programming language and flutter SDK to incorporate the android application environment.
* Used firebase server powered by google.
* We used firebase messaging for scheduling notifications periodically.
* We have also used weather widgets to fetch the weather data with the help of open weather API.[3]
* We have used google fit kit[4] to fetch the fitness measurements with the help of google fitness APIs

### **With the knowledge gained during the process, if you were to start a similar project, what would you try to do differently, and why so?**

Yes, I would like to do a similar project which could be integrated with machine learning frameworks to predict the future number of steps and that could be taken by the user. Additionally, we could timeline the tracking activity of the user by conveying the information through google maps. The user-selected events in the calendar should be able to communicate and check the status of the weather such that the user should be intimated whether he is eligible to execute the desired action at that select event of time.

**Section III**

1. ***What are the security risks for your app, and how are they mitigated? (If they are not mitigated at this time, how will they be mitigated in the future?)***
2. When a user gives improper input like providing invalid email format, the minimum length for the password, integer fields like height, weight, age, number of steps are solved by adding validation forms to all the fields. This security risk has been mitigated.
3. The data buckets are made private to prevent attacks from hackers. This has been mitigated.
4. OTPs have not been added when a user tries to log in.

Authorization and authentication have not been up to the mark.

1. The security rules in the firebase are defined as public. There may be a chance that anyone can modify, steal or delete data from the database.
2. Reverse engineering which means reversing the process of implementation and extracting design components has not been done.
3. Password encryption can be done using an SQL database. It is also possible to go for MongoDB but the disadvantage is to implement it in the java programming language.
4. We can also field-level encryption protecting private data.
5. But the encryption is done on the client-side only which is provided by the community version of MongoDB.
6. Passwords have not been encrypted and saved in the database. Suppose when a user forgot a password, he/she can reset the password but in the worst case, there may be possibilities that the newly created password may match with the old password. This can be mitigated in the future.
7. Mobile applications do not protect sensitive data like healthcare, financial data, etc. The data may be exposed if attackers try to steal data from the database.

**Section IV**

1. ***What are the important considerations to be successful in the mobile market, in your opinion?***

* We should survey whether the audience is preferring specific kinds of applications.
* There should be no delay in releasing the apps. To release an app, we should review the app. If we do a strict review, then the app may be delayed for release.
* We should do research about the market of what people are expecting from the developers and initially release a beta version of the app and then after resolving the bugs we should release the full version of the app.
* There will be huge competition if some other developer is doing a similar kind of app. We should make sure there should be a good user experience.
* After releasing the app, the developer should not stop. Instead, he should start to roll out advertisements on social media platforms to attract an audience.
* If we go for video advertisements, we must make sure that the video is smaller and give a detailed description how your app will look like.
* As users start to increase, the app will be discovered in the search bar and will be ranked higher if searches become higher.

1. ***Discuss some business models that can be used to make a profit from developing mobile applications. Is any of the mentioned models applicable to your app in your opinion?***

Common business models include:

* Advertisements: Advertising the app can reach a wider audience
* Subscription-based applications: We can provide basic features of the app to the users and add subscriptions to the additional features of the app.
* App sponsoring: we can help the app to reach an audience by sponsoring our app with companies that suit our application like adding music to the application. The popular music company is Spotify. By adding Spotify to the app helps the company to increase their market and to the app

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