



# Workout Tracker

tracking workout has never been easier.

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# Project Description

In the digital era we are currently living in now, working out is no longer connected to a physical space. One problem that is faced by gym-goers is finding the perfect app for tracking workouts, seeing progress and having a simple app that combines all these functionalities flawlessly. The Play Store for Android currently doesn't have any apps that fit these requirements. If they do have the functionalities, the design of the applications are limited and do not follow any HCI principles.

The purpose of this project is to design and develop a mobile workout tracker application and backend in Android. Developing and designing an app like this will help with gaining knowledge in mobile applications and database architecture. Building a system from scratch and fundamentally building the entire system will cover a number of areas including front-end, backend, database and testing. The system will be built to primarily be a workout tracker for gym goers to see their progress and make fundamental changes as they progress through their gym life.

A few aspects of the app's functionalities must be considered, such as which functionalities should be additional to that of the workout tracker. This is vital so that as updates are added to the app, the users are finding the functionalities useful. Ensuring the workout tracker is implemented initially is vital whilst following HCI principles as well as Google Material Design Principles. The workout tracker will also implement NFC to help with adding exercises quicker but to also give them information about specific exercises. NFC isn't currently used by exercise machines in gym and this will be needed to be implemented by contacting the local gym and placing NFC tags on exercise machines.

The app will be initially developed using sprints with one functionality implemented at a time. Once the initial functionality has been developed, it will be uploaded onto the Play Store for a focus group to download. Whilst the focus group are using the app, additional functionalities will be implemented whilst monitoring system issues or updates that may be required.

# Aims and Objectives

To create the system, a number of programming languages will be used to construct a full operational Android application. Java will be the primary language for the backend whilst XML will be used for the front-end. Research will be conducted to find the best way to create the architecture and ensure a solid database is created.

## Aims

The required aims are as follows:

1. Create a mobile application in Android
  - a. Track workouts into Calendar for a set day
  - b. Track exercises for each workout
    - Data visualisation of each exercise
2. Near Field Communication (NFC)
  - a. Add exercises
  - b. Provide information about exercises
  - c. Install NFC in exercise equipment
3. Log In System with Google
4. Upload to Play Store
5. Log weight and show trend
6. Upload progress photos

The desirable aims are as follows:

- Countdown timer system
- Connect with third party APIs including MyFitnessPal and FitBit
- Track steps and miles ran
- Calculate calories burned and calories consumed and show trend
- Add body measurement and show progress
- Calculate calorie intake for a user by taking in body weight, height, activity level and provide macro nutrients.

## Ethics

The Ethical Guidelines that have been set out by Cardiff University (Spasic, 2015), it is concluded that the Ethical Approval will be required if the application is to be set online for use by focus groups. To test the application, test data will be used, however to get feedback and to make updates, the application will be used by a focus group for usability testing and functionality testing. The data that is collected by the focus group will be sensitive as it is body weight, height and progress photos. It will be ensured that if approval is made, the guidelines are adhered to.

## Objectives

The main objectives for Workout Tracker to reach its aims are as follows:

1. Design and develop a workout tracker with NFC integration to add exercises
2. Create a solid architecture to store and retrieve data.
  - Connect to an existing API to add and view exercises.
  - Create an API to talk to the database for storing and retrieval of data
3. Analyse how each user will interact with the app
4. Create a user interface in Android that follows HCI principles and Google Material Design concepts
5. Evaluate the user interface by uploading app on Play Store and receiving feedback from a focus group
6. Show trends and patterns to provide extra information based off inputs
7. Android provide a documentation for NFC integration. This will be used to understand how to connect and use NFC in Android.
8. Connect app with existing libraries for good programming practise
9. Testing
  - Create test case document. This will will developed to ensure the system is compliant against the functionalities that have been set out
  - Ensure that the systems performs the functionalities as they are supposed to
  - Ensure that the system is user friendly. This should match a number of HCI principles as well as Google Design Principles. The tests conducted would ensure that each of the HCI principles are adhered to.

# Background Research

## Database

There are a number of different options for the database that could be used to develop the application on.

The first option that will be considered is the relational database MySQL. There are a number of benefits of using MySQL including the ease of use as it is a database system that has been consistently used in University whilst studying Computer Science. In addition, the community for MySQL is huge and support is readily available whenever necessary. MySQL does come with a few limitations however including it facing poor performance when scaling. It has a tendency to come to a halt if it is forced to deal with too many operations at a given time.

Another option is to use Firebase which is a NoSQL database. Firebase is fairly new but holds a number of benefits including that it is stored in the cloud so it is readily available everywhere. Firebase is very well known to be capable of handling real-time data updates between devices. Firebase also host the data which means hardware does not need to be worried about. However, Firebase does come with its limitations including that if the app runs on once centralised database which is updated by a vast quantity of users, it is a major overkill. The storage format is entirely different to that of SQL. There is also an increased cost with Firebase.

Another option that is possible is MongoDB that is also a NoSQL database. MongoDB has a number of benefits including sharding and scaling capabilities. MongoDB enables developers to easily and painlessly add or remove as many machines as needed (horizontal scaling). MongoDB is schema-less. MongoDB also faces a number of limitations however, including it is less flexible with querying e.g. no JOINS. There is also no support for transactions.

## Coding from scratch VS available code

Coding from scratch will enable the learning and development of full scale application from front-end development, back-end development, and database management. Coding from scratch increases the problem solving skill which is a huge requirement in the field of Computer Science. In addition, writing unique code means self-development and self review. This helps with understanding of code and increases confidence in self learning.

Conducting research online showed that there are code for workout tracking available online, however, this code is limited. There are a number of benefits to using open source code. One of which is that a number of developers have access to the code which means there is minimal bugs present. It also saves time from writing code that is already written. By understanding the code and adapting it to the requirement saves time and increases knowledge in understanding other developers code and understanding documentation.

## **Libraries**

### *Universal Image Loader*

UIL is a library which provides asynchronous, out of the box loading and caching of images. There are a number of other APIs to use however they lack in customisation. UIL provides configuration builder which enables almost everything to be configured.

### *EventBus*

When developing the front-end it is typical to have multiple Activities, Fragments, and other background threads be combined together. There are a number of issues using the conventional wiring of these elements together including complex and error-prone dependencies as well as life cycle issues. EventBus helps with event senders and receivers. This simplifies the communication between the app and its components.

### *Awesome-Android-UI*

This is a list of Android UI/UX interfaces following Google Material Design pattern and HCI principles.

## **NFC**

NFC (Near Field Communication) is becoming more widely popular to mobile phones and it's use grown since it's early days. NFC allows the sharing of payloads of data between an NFC tag and an Android powered device. There are a number of benefits of using NFC. One major benefit is it's ease of use. Instead of having to search through exercises to find the right one, the user can swipe on the tag and instantly load information and exercise instantly. NFC is also versatile and can be used in the app in a number of ways. Gyms can integrate NFC in not only their exercises but in their reception area for users to interact with and find 'daily workouts.'

# Work Plan

The work plan will primarily follow agile development. The design of the app will initially be developed to make it easier to understand what information will be on the system. Each functionality will then be conducted in sprints with testing completed after each functionality has been completed.

## **Week 1: 30/01/17 - Initial Plan & Background Research**

- Complete the Initial Plan
  - The current plan will be followed but it is subject to change throughout the duration of the project
- Background research into NFC and libraries
- Meet with supervisor

*Milestone: Submit the Initial Plan, Meet with Supervisor*

## **Week 2: 06/02/17 - Background Research, Risk Assessment & Architecture Design**

- Conduct background research and identify:
  - new and existing technology
  - possible database systems
  - appropriate libraries
- Select appropriate database management system
- Design database system
- Create a risk assessment with feasible solutions
- Identify social, legal and ethical issues

*Milestone: Complete background research, select and design database system, complete risk assessment, identify social, legal and ethical issues*

## **Week 3: 13/02/17 - Front-end Design & Architecture Development**

- Requirements
  - Outline the requirements for the mobile app based on any assumptions made
- Visual Design
  - Design front end on paper and pen
  - Create use-case diagram
  - Mock up designs online
  - Create flow of the app
- Setup working environment of the app
- Start development of front end
- Start development of API and database

*Milestone: Complete design and flow of front end, complete system architecture, write up report on design and architecture*

#### **Week 4: 20/02/17 - Front-end Development & Architecture Development**

- Continue front end development
  - Link up all pages
- Continue development of database and API
- Review meeting with Supervisor

*Milestone: Complete the front end development, complete report on design, architecture and API connection*

#### **Week 5: 27/02/17 - Login System & Workout Tracker**

- Create Login system with Google
- Start development of workout tracker functionality
- Implement Calendar View
- Add exercise to workouts
- Connect to exercise API
- Find focus group for app testing

*Milestone: Complete Login System with Google, write up report on Login System and workout tracker functionality*

#### **Week 6: 06/03/17 - Workout Tracker Cont.**

- Continue development of workout tracker functionality
- Test workout tracker functionality
- Make Play Store account

*Milestone: Complete workout tracker functionality, test workout tracker and upload to App Store as Version 1, write up report on testing workout tracker*

#### **Week 7: 13/03/17 - NFC Integration**

- Start development of NFC with workout tracking
- Add exercise
- Give information about exercise

#### **Week 8: 20/03/17 - NFC Integration Cont. & App Feedback**

- Continue development of NFC
- Add NFC to local gym for testing
- Test NFC at local gym
- Receive feedback from focus group
- Review meeting with Supervisor

*Milestone: Complete NFC development, test NFC at local gym, write up report on NFC development and testing*

### **Week 9: 27/03/17 - Body Weight Integration**

- Start development of body weight logging
- Track weight on a set date
- View trend of body weight
- Test body weight logging

*Milestone: Complete body weight logging functionality and testing, write up report on body weight logging functionality and testing*

### **Week 10: 03/04/17 - Progress Photo Integration**

- Start development of progress photo functionality
  - Upload photos
  - See progress photos side to side

### **Week 11: 10/04/17 - Progress Photo Integration Cont. (Easter Break Starts 8th)**

- Continue development of progress photo functionality
- Test progress photo functionality

*Milestone: Complete progress photo functionality and testing, upload update to Play Store, write up report on progress photo functionality and testing*

### **Week 12: 17/04/17 - Testing**

- Create test case documents
- Unit testing
- Start user testing
- Write up report

*Milestone: Complete the test cases, complete user testing and feedback, complete unit testing write up report for testing, write up report on test case documents*

### **Week 13: 24/04/17 - Testing Cont.**

- Write up final report
- Contingency time
  - Test and update existing functionalities
  - Add desirable functionality if time is available

### **Week 14: 01/05/17 - Final Report (Easter Break Ends 30th)**

- Contingency time
  - Test and update existing functionalities
- Write up report

*Milestone: Complete the final report*

## **Deadline: 05/05/17 - Upload Final Report**

- Upload final report

### **Project Meetings**

Meetings will be held with the supervisor on a weekly basis to see progress and get updates on progress of the application. Any alterations that occur and change the development of the implementation will be shown in the report. The project meetings will be recorded throughout the project.

## Appendix

<http://dba.stackexchange.com/questions/81349/what-are-the-advantages-and-disadvantages-of-firebase-for-a-database>

<http://stackoverflow.com/questions/5244437/pros-and-cons-of-mongodb>

<http://oss-watch.ac.uk/resources/whoneedssource>

<https://infinum.co/the-capsized-eight/top-5-android-libraries-every-android-developer-should-know-about>

<https://developer.android.com/guide/topics/connectivity/nfc/index.html>

<http://users.cs.cf.ac.uk/I.Spasic/ethics/>