Contents

[Analysis 3](#_Toc511849396)

[Key Terminology 3](#_Toc511849397)

[Project Background 3](#_Toc511849398)

[Description of the Current System 3](#_Toc511849399)

[Problem Identification 4](#_Toc511849400)

[Investigation Techniques 5](#_Toc511849401)

[Interview 5](#_Toc511849402)

[Observation 5](#_Toc511849403)

[Questionnaire 6](#_Toc511849404)

[Documentation 6](#_Toc511849405)

[Identification of client 6](#_Toc511849406)

[Identification of Prospective Users 6](#_Toc511849407)

[Identification of user needs (client and end-user) 7](#_Toc511849408)

[Key Formula/Equations 7](#_Toc511849409)

[BMI Body Mass Index 7](#_Toc511849410)

[Kilogram to Pound Conversion (Metric System to Imperial System) 7](#_Toc511849411)

[Level 1 DFD – Current System 7](#_Toc511849412)

[Data Dictionary 7](#_Toc511849413)

[Outline of Proposed Solution 8](#_Toc511849414)

[Data Sources and Destinations 8](#_Toc511849415)

[Acceptable Limitations 9](#_Toc511849416)

[Objectives 9](#_Toc511849417)

[Level 1 DFD of Proposed System 10](#_Toc511849418)

[Discussion of Hardware and Software 11](#_Toc511849419)

[Entity Relationship Diagram 11](#_Toc511849420)

# Analysis

## Key Terminology

Muscular Hypertrophy: The gain in muscle size, due to repairing a damaged muscle.

Sarcoplasmic Hypertrophy: Increase in glycogen stores in muscle, increased endurance

Myofibrillar Hypertrophy: Increase in size of muscle fibres, increased strength

Progressive Overload: This simply refers to the increase in either through Frequency, Intensity, Time or Type (FITT). Progressive Overload is a training principle which is essential for increase in fitness, it means the person must work harder to get better, an example could be increasing weights / reps or even doing a harder exercise. This will be implemented in all the workouts by the program, it will ensure the user works harder every week.

Timetable: This will show you the times of the week, and when exactly you plan to do a workout.

Training Objective: A target which the user chooses to work towards. By doing this their workouts will be tailored to achieve this. E.g is your main aim to Bulk / Lean / General Fitness

Time under tension: The time of which your muscles are contracting or extending.

Type 1 Fibres: Slow twitch fibres, used for endurance activities. They are more efficient at producing ATP through respiration, hence they can extend and contract for long periods of time before fatigue. They contain large quantities of myoglobin, an oxygen carrying pigment of muscle tissues and mitochondria, which undergoes respiration.

Type 2 Fibres: Fast twitch fibres, used for short burst of intense physical activities. They rely more on anaerobic metabolism to respire, but they fatigue faster. Type 2 fibres are known to produce more force and can contract at higher speeds. Type 2 fibres are also known for the “size” or built physique.

User Profile: Each user will have their own personalised profile, and settings. When they sign up, an account is made and the corresponding data is stored in the main server.

Workout Plan: A set number of exercises, performed in succession. Each exercise, will have the reps and sets, and the weight or time. A work out plan can be made by users, they can upload it to the main data base where it can be shared among other users.

## Project Background

Doing exercise is one of the most important factors to a healthy lifestyle. Therefore, it is crucial people understand how to exercise properly so they get the beneficial results they desire. One of the most desired aspects of fitness people want is muscular growth, this is achieved most effectively in the gym. Routines consist of exercises, which are performed by gym goers to build muscle over time.

## Description of the Current System

When a person goes into the gym, they will always follow a routine. A routine is a set of exercises done in progression. The routine and how one performs it, is highly dependent on the individual because it will be structured on what they want to improve and their current fitness level.

Before going to the gym, a weight lifter should have a clear indication of the types of exercises he or she will be doing, the sets and reps, the rest periods and the intensity. When the user enters the gym, it is highly advised they stretch and warm up. This will increase blood flow to the body, reduce the chance of injury to muscles.

Heavy exercises which require more effort and energy will be usually done first, this is because it will fatigue the muscle the most. As the routine progresses the weight will get progressively lower, but the reps will get higher to maintain the intensity. An example: a person training his legs, will first perform his heavy compound exercises first, such as the squat (Back, Hamstrings, Quadriceps, glutes) and deadlift (Back, Hamstrings, Quadriceps), before moving onto isolation exercises, which only target 1 muscle group, such as the leg extensions (quadriceps) and leg curls (hamstrings).

After the routine is done, a cooldown is usually incorporated. This can take form of low intensity cardiovascular exercises and stretching.

A routine is usually written down to record sets and reps. This can be done electronically on notes, or spreadsheet, or physically like in a notebook. This logbook can be referred to for future routines to remind users of exercises. Examples of these may be found in *Appendix,* under *evidence of current existing systems. 2.2.1-2.2.4*

A routine is designed to get harder with time because as the user improves, he will find his old workout to easy. The concept of increasing the intensity of a workout is known as progressive overload. All gym goers will implement this in some way, using FITT principles, which can be referred to under *progressive overload* in key terminology on page 3.

## Problem Identification

There are many problems people face in the gym. Using a questionnaire, I have identified the main problems a small sample of students face when going into the gym. Please refer to *Appendix fig 2.1.1 to 2.1.4* for statistical evidence.

Starting with the main problem, according to fig 2.1.4, 6 out of the 8 students, chose “Lack of discipline and motivation”. Discipline and motivation are key for improvement, because without effort reduces and intensity drops, hence leading to a poor workout. A lack of discipline can be cause by a lack of structure to their weekly routine, and/or a lack of variation to their workouts. This is can be further shown by the client interviews from client 1, whom states he finds it difficult to go to the gym often because “[he] finds it difficult to be motivated”. In addition, the routines provided in the gym, as shown in Fig 2.2.4, only limit users to 3 exercises per body part and no data on order of exercises or rest periods are shown. Therefore, even with knowledge of exercises, without a planned routine, the user will perform the exercises with no structure, which will result in poor time management in the gym.

The second most prevalent problem, was “Doing the same workout repeatedly with no change to intensity”, hence the lack in progressive overload and variation. This can result in tedium, doing the same thing and expecting results will cause people to waste their time.

Safety is also an important issue, with 37.5% of people (in the survey) saying it was of their concern, however injury is nearly inevitable as all gym goers have experienced it. For example, many new gym goers do not know how to perform an exercise with correct form, this may lead to injury, e.g when squatting they lie the bar on the neck and not the traps. In addition, overtraining can result from a poor routine structure, e.g workouts are done too close to each other, not allowing rest and recovery, or workouts may be too intense. In interview with client 3, *refer to appendix interviews*, he states that his main concern is safety especially when he moves onto heavier weight hence form is crucial and once small error can cause failure in the execution of the rep.

The final main problem, with 25% of people voting for it, was “not knowing what to do”. This problem is shown by Client 2, who states he does not train his legs because he was not taught by his friends, and does not want to try something new without knowing what to do. As a result, client 2 trains primarily arms, chest and abs, neglecting other essential body parts such as legs, shoulders etc. This is often a problem for beginner to intermediate gym goers, as they have limited bank of exercises, as a result it can see themselves doing the same limited sets of exercises. “Not knowing what to do” could be down to two main factors: firstly, the gym goer may not understand what they are training for because they do not have a clear goal in mind. Alternatively, if they do have a clear goal in mind, it could be that they don’t not know how to reach it because they lack the knowledge of structuring a routine and executing it.

## Investigation Techniques

|  |
| --- |
| *Questions asked in Interview*   * *a.) How do you plan and record your gym routines every week?* * *b.) How is each routine executed, give me an example if necessary?* * *c.) What is your biggest issue you face going to the gym?* * *d.) What feature would you want a new proposed system to have?* |

### Interview

*Please refer to Interview section under Appendix to see transcript of interview*

I interviewed 3 clients, Client 1 [Beginner], Client 2 [Intermediate], Client 3 [Advanced], each of them had different levels of experience. The main aim of this interview was to understand how each client went to the gym, this was to identify the current system for each client, which was how routines are performed and how they’re recorded. I asked them several questions each. First two questions were to investigate how they planned, recorded and executed their routines. Third question was on what their biggest problem was and the final question was a suggestion that they could give to improve the current system.

For the first question, the common trend for having a “plan” was, each client had a day dedicated to train a specific body group. There were however, obvious differences between routines, due to large differences in experiences between clients, client 1 had a much different training routine to client 3, referring to *Interview*, client 3 trains 6 times a week where client 1 trains 2 times. Client 1 also did not have set days going to the gym, whereas Client 3 and to some extent Client 2, had a more structured weekly schedule. Even though all the clients had a “plan” to some extents, none of them recorded their plan down.

Relating to the 1st question, the 2nd question investigated how clients executed their training plan. In all cases, each client will target specific exercises corresponding to body group, and will start each workout with a warm up. However, for the main part of the routine, Client 1 stated that he was being helped by his friends, so he took turns doing exercises and did as much exercises as possible within a time frame. Client 2 and Client 3 however stated that they often started with heavier exercises and moved onto lighter ones later. Client 3 went further and stated that he was using drop sets, reducing weight after every set till muscle fails, and supersets, switching exercises after every set, these are both types of training methods which can be incorporated to achieve progressive overload.

The 3rd question identified main problems clients had when going to gym. The main problems were: lack of motivation and consistency; they struggle to go to the gym and stay motivated, lack of knowledge on new exercises; hence they keep doing old routines without change, and safety.

The final question prompted a solution by each client. They suggested:

* Having access to more exercises, and definitions or examples on how to perform them.
* Having a weekly timetable to help them structure their routines
* Having a dynamic routine that changes its intensity when it is next performed

### Observation

I started going to the gym in 2014, and hence, not only have I have planned and executed many different routines, but I have experienced many of the difficulties beginners would have faced. I have also brought friends to the gym and observed how they first adapted to routines and their development. I have tried different ways of getting routines, mainly through internet resources such as YouTube and online articles, and during 2015, I recorded my routines for 10 months which can be seen in the *Appendix, Evidence for Current Systems*, where I was able to track my progress.

### Questionnaire

Please refer to *Appendix* -> *Questionnaire,* I sent a google form to 8 clients. I asked them questions on identifying how they went to the gym, and their biggest problems. I have tabulated the results graphically which can be referred to in that section. I have analysed their responses under *Problem Identification*

### Documentation

I went to look for current systems, which in this case was how routines were recorded. I found several examples of how training plans were recorded, this can be found under *Evidence for current systems* in *Appendix*. I had a 10-month record of all my gym routines that I had done and my coaches routine that he had given to me in a training session. In addition, I went to my local gym and took a picture of the available gym routines. Using this evidence, I could see how routines were recorded and the advantages and disadvantages of each.

In figure 2.2.1 and 2.2.2, it shows the documentation process I underwent for 10 months from 2015 Feb to October. The disadvantages of this method are: it was very time consuming because it required manual input into a document, which I had to format. In addition, the data

Figure 2.2.3 is a routine given to me by a coach via an email. The advantages of this was that it was an easy way to get new routines, by a reliable source. However, the disadvantages were: I was only given 1 routine (limited amount of times I can do), and I needed access to my email and my teacher’s knowledge to help create a routine, therefore it is inefficient.

Figure 2.2.4 is a poster in a gym, which provides you the information on how to perform an exercise. The advantage of this is that, it gives people a visual and informative description on how to safely execute exercises, and it gives users knowledge of 3 exercises per major body part. However, this does not provide you the routine, it only provides you the exercises, and therefore the users will still need to come up with their own routine, such as order, sets, reps, rest time.

## Identification of client

I have 3 main clients, all of which I have interviewed and will keep regularly in touch with. (Review interview transcript) These 3 clients all have different range of experiences ranging from less than half a year to 3 years. I have specifically chosen these 3 clients because I will be able to get frequent feedback from all of them. In addition, each client has a very different training background, hence will give me a good overview of client demands and feedback.

## Identification of Prospective Users

Beginners: They will be able to build a solid foundation of discipline and knowledge because they will have access to work out existing routines, which can be adjusted for their fitness levels. In addition, each exercise will have a step by step guide on how to perform it effectively. Training principles will also be implemented in routines, allowing the beginner to get into a good habit of pushing themselves.

Intermediate and Advanced: As these users already have good experience of training in the gym, they will be more likely to plan their own routine, to help structure their workouts and to maintain their training discipline. These users will also be subjected to training principles, as this is crucial for improvement in fitness. These users are expected to make more workout plans, allowing them to use and share it with other users.

Fitness Coaches: These are people that don’t do them workout themselves but teach and monitor people doing a workout. This gym app, will help them record their client’s previous records of exercises, identifying targets and showing the gradual improvement of the client.

## Identification of user needs (client and end-user)

**Users (Advanced/Intermediate/Beginner/Coaches)**

-Plan their workouts in a weekly timetable

-Find a workout

-Create a workout which can be referred to during the workout

-Share a workout

-Find a way of educating users on how to perform new exercise

## Key Formula/Equations

### BMI Body Mass Index

An approximate measure of whether someone is over/underweight, used to estimate fat percentage.

**Weight / Height\*Height**

*Please note that BMI is simply an approximation for the general population, it is not an accurate indication of fat percentage for people with extreme body types, such as those of athletes.*

### Kilogram to Pound Conversion (Metric System to Imperial System)

1 kg = 2.2 lbs

*If in the gym, a rough approximation of multiplication/division of 2 can be accurate for lower weights*

## Level 1 DFD – Current System

Executes routine in gym

Selects routine based on body part

|  |
| --- |
| User |

Changes routine based on feedback

Routine stored

## Data Dictionary

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Description | Format | Example |
| Exercise | The name of an exercise | String | Barbell Curls |
| Rest period | The length of duration one rests between sets | Integer | 45 second rest between sets |
| Rep | One single repetition of an exercise | Integer | Doing 1 squat |
| Set | A specific number of reps grouped together, performed in succession | Integer | 8 reps of Squats |
|  |  |  |  |

## Outline of Proposed Solution

Based on my *research and investigation* of current systems, (please refer to Problem Identification and Research Techniques), I have proposed a solution to many of these problems by creating a gym app, which will centralise around scheduling routines, tracking progress and providing routines. My app will consist of a timetable, which will be personalised to the user, allowing them to create workouts and choose the day which they want to execute it. The app will also be designed to automatically adapt a workout, based on user responses, to ensure optimal workout effectiveness.

My main goal will be to make the app easy to use, therefore the user will be more determined to stick to their training as workouts are more easily found and performed. Here are some specific problems, from the current system, which I have chosen to address.

Problem: People have no plans to follow or don’t know what to do / People want more plans to do

Solution: Workout plans will be made by other users and uploaded into a database. This allows any user to find workouts to do. Based on the user’s level, the workout will be adjusted to their fitness level. In addition, users may create a weekly time table of routines, so they can structure their training regime and become more disciplined in their workouts.

Problem: People need to stay motivated through training

Solution:

The weekly time table and the routine will structure their workout making sure they stay motivated and disciplined. Past logs, record the previous workouts and help show the improvement. Every week, depending on their input, the workout generally gets harder, this makes sure the client avoids tedium, at the same time making sure overtraining does not occur. This ensures client stays motivated through training period to achieve their goal.

Problem: Safety

To ensure safety, the app will allow people to click on each exercise to access a step by step guide on how to perform exercises. Also, past record of logs will be able to show previous weight lifted, allowing users to know their own strength preventing injury by lifting too heavy.

In conclusion, my proposed solution will be a gym app that’s main aim is to help users of all fitness level to have access to an easy way of planning their workouts. This will allow them to become more disciplined and will improve user’s determination.

## Data Sources and Destinations

* Data Source

**User**

- Profile: When making a profile they will input their name, email address, profile picture, level of experience.

- Timetable: They will need to input their chosen routines into the days of the week

- Routine: When creating a routine, they need to input data such as the type of exercise, reps and sets, rest periods. This is done using a standard format, requiring the user to choose from a drop-down list.

-Feedback is inputted by user after every workout.

* Data Destination

-Database: The completed routines will be stored in a database. This allows routines to be stored and retrieved. Routines will be displayed in a readable format on the screen.

-Past performed routines are stored in a log, which will display the routine name, which can be used to retrieve the routine, and their feedback.

-Email: An email will be sent once a week to the user, showing them their weekly time table.

-Workout: Routines which are currently being viewed or performed will be outputted onto the screen.

## Acceptable Limitations

The website will not be able to monitor the physical progress of the user, rather it relies on the user’s honesty and judgment of their inputs into the website.

Website cannot ensure every exercise done is free from risk, rather it will reduce the chance of injury, by educating the user beforehand on how to do the exercise.

The website / app cannot ensure progress due to factors such as client’s lifestyle, which includes diet and sleep. To see improvements, both training and a healthy lifestyle must be implemented.

## Objectives

|  |  |
| --- | --- |
| No | Objective |
| 1 | **Logging In** |
| 2 | **Registering** |
| 3 | **Security of password**   * Hashing * Secure Database |
| 4 | **No unnecessary personal information (Data Protection Act)**   * **Secure Database, password protected** * **No unnecessary data** |
| 5 | **Data Redundancy**  (data stored only at one place where necessary) |
| 6 | **Data integrity**  (data is correct, no calculated fields, must input in run time) |
| 7 | **Allow user to create a personalised profile, by adding a profile picture** |
| 8 | **Allow user to change password** |
| 9 | Allow user to create a workout by adding exercises from a list, and choosing reps , sets and time. |
| 10 | Allow the routine to be outputted in a organised manner with appropriate inputs to take in feedback. |
| 11 | Able to store workout in data base |
| 12 | Allow user to search for and retrieve a workout from data base / Allow all users to search for a workout, using filters. |
| 13 | Display information belonging to a routine in the timetable, e.g day of the week, name of routine, muscles trained, and whether the user has completed the routine. |
| 14 | Allow user to input routines into weekly timetable |
| 15 | Allow user to remove routines from timetable |
| 16 | Allow user to access a definition and an image of each exercise in a routine |
| 17 | Allow user to keep a log of previous routines |
| 18 | Allow user to input feedback: Easy, Challenging, Too difficult |
| 19 | Allow routine to suggest an increased weights if feedback is too easy |
| 20 | Allow routine to suggest an decrease weights if feedback is too challenging |
| 21 | Allow users who have done the routine before in the last 31 days, to have suggested starting weights which take account their previous feedback |
| 22 | Allow user to change password when password is forgotten using email |

## Level 1 DFD of Proposed System

Make Profile

Makes Time Table

Update workout &

Store workout in user’s log

Take in feedback

Allows user to plan and perform routine

Retrieve Routine/Timetable

Display: Date, Routines in the week

Search for Routine / Creates Routine

Central Database

User

## Discussion of Hardware and Software

**Hardware**

My gym app will be mainly designed to run on mobile devices, this is because, users need their gym routine when they are in the gym, and most users always bring their phone, therefore it is convenient to the user. My app must be able to display data through a mobile phone screen.

**Software**

I will create my app using a PHP, HTML and CSS. The software, my app, will be built around being user friendly while allowing users to access all available features. My app will rely on a database which will store existing data about the user.

## Entity Relationship Diagram

