

Development of a Fitness Web Application: A simulation of a personal trainer

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Abstract

This project discusses the development of a personalized fitness web application called StarFit, based on MySQL, PHP and JavaScript with AJAX techniques. The aim of the application is to simulate an online personal trainer that will deliver personalized content such workout plans and articles to registered and authorized users and allow them to submit their progress. The personalized content delivered to the user is based on the information that they provide when creating their profile during the registration process.

The workout plans and articles are stored in the database and are characterized by certain attributes such as level, gender and fitness goal. The delivery of personalized workout plans is programmatically achieved by matching the information the user provides with the type of attributes that workout plans and articles have.

The report begins with a small description about the relationship between fitness and technology and how the combination of both can contribute in reducing the problem of obesity nowadays. The focus is then given in web personalisation process and the variety of techniques which are thoroughly examined in the literature review. Therefore, after a detailed examination of the web personalisation process the most appropriate technique is chosen for the StarFit web application.

In addition to the website, a custom content management system will also be developed in order to allow website administrators to view and manage the content and the users of the website as well as make important decisions about the future movements for the business.

Finally, the report demonstrates the complete development life cycle of the system from the analysis phase to the testing phase.

1 INTRODUCTION

1.2 Technology and Fitness

There is no doubt that the use of technology is constantly increasing in many aspects of our daily lives nowadays (Hayward, 2014). Although the advancements in technology that have been introduced facilitate many tasks in our daily lives, they have also affected our health in a negative way (Hayward, 2014). The negative impact of the use of technology are mostly reflected in our health, our physical activity in particular (Hayward, 2014).

Certain forms of technology may have a negative impact on peoples' physical activity level. The excessive use of telecommunication and communication mediums including the large number of hours spent in watching television or playing video games as well as the constant communication through social media via computers or mobile devices have resulted in people adopting a sedentary lifestyle. On the other hand, technology may be seen as a means of promoting physical activity (Burns et al, 2012; Zhu, 2008).

The World Health Organisation (WHO) has revealed that there is an ongoing increase of obesity and overweight worldwide which results to heart diseases, diabetes and osteoarthritis disorders. According to the figures from statistics, the number of obese people has doubled since 1980, with 39% of adults to be overweight and 13% to be obese (WHO, 2015). The WHO defines obesity 'as abnormal or excessive fat accumulation that may impair health' which is caused by the increased consumptions of foods that contain high amount of saturate fats combined with a decreased levels of physical activity (WHO, 2015). According to the WHO, obesity can be overcome by adopting a healthier lifestyle such as including a healthier choice of foods and physical activity in daily life. Therefore, actions need to be taken at global, regional and local level to increase public health awareness and create the grounds that will promote healthy lifestyle and change peoples' approach to healthy eating and physical activity (WHO, 2015). The advancements of technology and the ongoing emerging of new electronic devices with high intelligent capabilities can be utilized in an attempt to increase peoples' awareness of health and physical activity and change their sedentary life (Burns et al, 2012; Zhu, 2008).

1.2 Information on the Web

It is widely recognised that the World Wide Web is continuously evolving since the beginning of its inception, with new web technologies and trends to be introduced and largely influence peoples' lives on an ongoing basis (Berners-Lee, 1996). There is an overwhelming amount of information and resources that are stored in computers and available through the World Wide Web nowadays (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). While this easily accessed information and resources illustrate how powerful and influential the web is, it however makes it complicated for the users to retrieve the results that are specific to their search criteria and the information they need (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). As a result, it becomes essential for websites, web applications and portals as well as search engines to

discover a way to filter the search results and deliver information that is relevant to the users' search criteria or needs (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). Therefore, personalisation is what information delivery services (e.g. search engines or web portals) need to apply in order to overcome the problem that is posed by the overabundance of information and deliver only the information that is relevant to their users. In this way, users' interaction with the Web will become more efficient (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003).

1.3 Project Description

1.3.1 Concept of the Project

This project describes the development of a personalised Web application. The overall purpose of this project is to develop a fitness web application that will simulate a personal trainer that provides users with personalised content including exercise and nutrition plans along with health and fitness advice tailored to the users' preferences and needs. The word 'personalised' indicates that the Web application will be developed by using at least one personalisation technique along with the appropriate algorithms in PHP in order to process the information that the users provide and deliver relevant content to them.

Since the goal of StarFit application is to provide personalized content to its registered users, the process of web personalisation will be thoroughly described further in this report. The application will use explicit personalisation techniques through the use of a registration form as well as allow users to submit their progress when necessary.

After describing the concept of web personalisation in the literature review, the application development life cycle will be explained and demonstrated with screenshots of web pages of the application, tables' of its database and segments of code. Initially, the requirements and expectations from the system need to be defined in the analysis phase. Then the application's web pages mockups along with its database structure must be defined prior to the beginning of the implementation of the application.

2 LITERATURE REVIEW

2.1 The Concept of Web Personalisation

In the past, information delivery services did not take into consideration the needs of the user. As a result, the engines would return the same results for the same search query (Micarelli et al, 2007). However, with personalisation on the Web, search engines are programmed to trace users preferences based on her/his search query. As Micarelli et al argue, personalisation refers to the process of 'adapting the results according to each user's information needs' (2007 p. 195). According to Macarelli et al, the combination of the behaviour of users in the Web and their interaction with the Web information sources is subject to evaluation (2007). If the users'

behaviour and interaction with the Web is well understood by web and software companies, then personalisation can be easily integrated into the web search tools as well as web applications (Micarelli et al, 2007).

In a similar vein, Eirinaki and Vazirgiannis define website personalisation as ‘the process of customising the content and structure of a Website to the specific and individual needs of each user taking advantage of the user’s navigational behaviour’ (2003 p.4)

Personalisation techniques are employed by websites in an attempt to provide users with the most relevant information and best possible experience when navigating over the website. In this way, not only will users retrieve the information that they search for but also the website will become attractive to return to (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003).

There has been a lot of research done on Web personalisation and a variety of techniques and ways of applying personalisation have been evolved over the time. According to Kim, personalisation exists in two contexts (2002). In the first context, personalisation refers to the receiving of overwhelming information and then filtering such information according to the internet users’ needs (Kim, 2002). In the second context, personalisation can be used as a way to facilitate one-to-one marketing where a business targets a group of users instead of ‘the entire population of its marketing territory’ (Kim, 2002).

In the first context, personalisation is when the information delivered to the user is most importantly relevant to her/his search query, in the format (e.g., HTML, PDF, WORD, ASCII, LaTex, etc.) and layout requested and always updated (Kim, 2002). Kim divides the personalised information delivered to the users in two categories (2002). Firstly, it is the type of information that is coming from one information source directly such as an image of a particular person, a word document about a historical event or a PDF file of research paper (Kim, 2002). Secondly, it is the type of information that is transformed from one or more information sources such as the Web pages of a document which is stored in HTML or XML format in a website or an article stored in an online Journal (Kim, 2002).

Regarding the second context, Kim notes that personalisation is used by businesses in order to reduce their loss and increase their revenue by targeting a particular group of customers and understanding their lifestyle, preferences and needs (2000). This is achieved by observing the behaviour of the user and the preferences that she/he demonstrates during the use of a service such as a website and then store data about those preferences. In this way, businesses will accurately predict what their customers is in favour of (Kim, 2000). For instance a company would suggest a customer to buy the CD of her/his favourite singer or dine in restaurant that offers her/his preferred food e.t.c. Generally in both contexts personalisation is the delivery of information that is selected based on the needs and preferences of a group of people who then retrieve such information from information sources (Kim, 2000).

It seems that personalised websites are gaining an ongoing popularity among the users of the Web. According to a survey carried out by DigitalLBI Connected Commerce, personalised web experience is highly attractive for the Web users (DigitalLBI, 2015; Moth, 2015). Specifically, 62% of the users would feel confident in purchasing from a personalised online retailer, 27% would

search for personalised offers when shopping online and 75% would prefer to log in to e-commerce websites that demonstrate an understanding of their preferences based on their behaviour data that were stored in the e-commerce website (DigitalLBI, 2015; Moth, 2015). It also seems that the world of business and marketing have realised the importance of the personalised experience and the strong impact it has on their website users/customers (Moth, 2015). According to a report based on a survey carried out by Adobe ‘Digital Roadblock’ about the Digital Trends in 2015, ‘targeting and personalisation’ is the highest priority of the marketers (Moth, 2015).

2.2 Web Personalisation Techniques

There are various techniques that can be employed in web personalisation in order to increase the possibility of returning the most relevant and useful web pages to the users. Web personalization techniques vary according to the type of personalization that is employed. For instance, Web search engines such as Google and Web crawlers (or Web robots) support keywords-based search (Kim, 2002). Specifically, indexes on keywords are maintained in Web pages which is something that allow users to use keywords in order to search for the information they need. Web directories such as Yahoo! Directory have a different purpose which is to organize the websites into sectors and categorise them based on their content. Meta-search engines such as Metacrawler query and filter all the results of search engines such as Google, Ask.com, About.com, Bing and Yahoo! and return a list of the most relevant Web pages to users based on their query (Kim, 2002).

Some scholars classify Web personalisation feedback techniques in two categories: explicit and implicit (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). Explicit feedback techniques which are introduced in the Information Retrieval field such as *relevance feedback* and *query expansion* can be equally applied in the Web personalisation context (Micarelli et al, 2007). Query expansion is the process where user’s query is automatically expanded with suggested by the system- words. These words are chosen from Web pages which the user has shown particular preference for, through feedback provided by the user (feedback form) (Micarelli et al, 2007). However, the effectiveness of the above techniques is doubtful since according to some studies, users are most likely not willing to provide feedback or explicitly specify information about their needs (Micarelli et al, 2007).

On the other hand, user involvement is not required in implicit feedback techniques. That is to say, the user is not required to provide any information via completing a feedback form or use the most appropriate queries in order to specify her/his needs (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). On the contrary, user’s behaviour will be tracked and monitored by the system through the use of *usage data* on the server-side such as server access logs, browsing histories as well as cookies and keyboard/mouse tracking on the client-side (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). The following diagram illustrates how implicit feedback techniques can return personalised results to the user without requiring user involvement (Micarelli et al, 2007 p. 203).

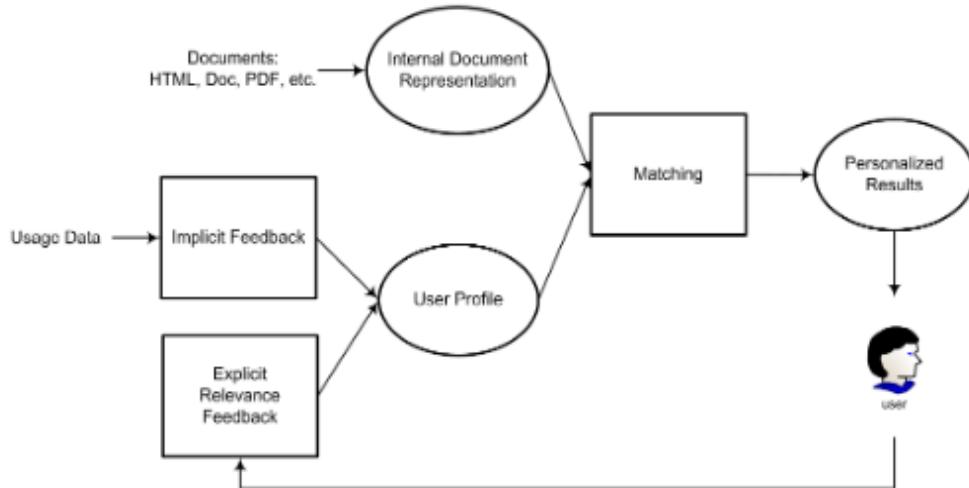


Fig. 6.3. Implicit and Explicit Feedback are used to learn and keep updated the profile of the user used during the personalization.

According to Kim, there is a variety of data sources including relational databases, data warehouses of users' demographic, lifestyle and transactions and profile databases that include general population's profiles that are utilised by web personalisation techniques (2002). The most commonly used web personalisation techniques suggested by Kim are the following (2002):

Lookup of personal records in a database/file

This technique refers to requesting and extracting relevant user information from a database by using keywords such as user name or ID. Web applications store personal information about their users (such as demographic and lifestyle data, history of product purchases or inquiries, transaction or credit data) in their database either in one or more tables and use the user name or ID in order to identify the user and her/his personal record (Kim, 2002).

Lookup of a rule base or a profile database

A rule base or profile database is the combination of specific search criteria for a user (such as income, sex, age, area of residence or ethnicity) stored in database warehouses¹. In most cases, a rule base or profile database is output of a mining process such as data mining, web log mining, text mining or OLAP techniques which are explained below (Kim, 2002).

Data mining of numerical and string data in formatted tables/files

According to scholars, data mining algorithms are used to fulfill a range of purposes such as clustering (or grouping) of data based on common characteristics, classification or

¹ Central repository of data coming from various sources which is used for reporting and data analysis.

categorization of data, predicting future events based on previous events such as for instance what will be the next purchase of a user following her/his previous one (Kim, 2002).

Web log mining

Initially, web log mining was used by website owners in order to maintain accurate control of the amount of bandwidth and server capacity for their company or organisation (Agosti and Di Nunzio, 2007). Nowadays, web log file are used by website administrators to collect information about their visitors' profiles and behaviour, that is, their interaction with the website as well as their purchasing activities in order to improve their visitors' experience and interaction with the website. Web log files can provide information about the Website's usage such as visitors' IP addresses, period of access, the most visited Web pages or the number of visitors' returning to the website, problems visitors encounter during navigating the website as well as problems in relation to the security of the website (Kim, 2002).

Text Mining

Text Mining is a web mining technique used to extract information from various written sources and obtain information about keywords that is, frequently occurring words or phrases and other information such as names of people, organizations or products as well location or prices (Kim, 2002). This information is kept in a knowledge database and used to determine the category for a text (Kim, 2002).

OLAP

OLAP (online analytical processing) is a computer-processing technique that is user by website administrators, managers or analysts in order to obtain summaries, totals or maximum and minimum amount of data (e.g. sales) (Kim, 2002; Rouse, 2015). In contrast with the two-dimensional relational database, OLAP is based on a multidimensional database model (Rouse, 2015). This means that the data are grouped by certain fields and the summaries of data are computed for each group (Kim, 2002).

2.3 Categories of Data used in Web Personalisation

For the application of the personalization techniques, it is essential to define and make use of Web data. According to Eirinaki and Vazirgiannis, Web data can be classified in the following categories (2003):

Content data including text, images or information coming from databases in Web pages.
Structure data represent data entities within a Web page such as HTML or XML tags or hyperlinks.

Usage data is stored in a Web access log for recording a Website's usage. Usage data include Website visitor's IP addresses, time and date of access, the directories accessed and the referrers' IP address.

User data is different from usage data and is analysed from a machine learning perspective (Micarelli et al, 2007). User data is the information about each user's profile and is usually retrieved through registration forms or questionnaires or by analysing Web server logs (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003). User profile data include demographic information (such as name, age, country, marital status, education, interests etc.) and information about users' interests and preferences (Micarelli et al, 2007; Eirinaki and Vazirgiannis, 2003).

2.4 Automatic Web Personalisation Stages

Eirinaki and Vazirgiannis suggest that the usage-based Web personalisation is a five stage process and can be achieved though the interaction between those stages and the use of Web data by the 'usage-based Web personalisation system' (2003 p. 3). Each of the five stages is described below.

2.4.1 User Profiling

The purpose of this stage is to create a profile for each user of the Website in order to provide the most relevant content and structure in the Website to the user's specific preferences (Eirinaki and Vazirgiannis, 2003). The user's profile contains information about user's place of living (demographic information), interests, other more specific information such as name, age, sex, marital status, education, occupation e.t.c., as well as information about user's interaction with the Website (Eirinaki and Vazirgiannis, 2003). User profiling can be achieved by using either an implicit or explicit technique, briefly discussed in the previous section. Explicit profiling is the process of collecting user information through a registration form or questionnaire completed by the user requiring her/him to specify personal information and preferences (Eirinaki and Vazirgiannis, 2003). On the other hand, the aim of implicit profiling is to track the navigational behaviour of the user through the use of cookies which collect and store information about the user (Eirinaki and Vazirgiannis, 2003).

2.4.2 Log Analysis and Web Usage Mining

When the process of user profiling is complete, the information about the user is stored in Web server logs. These logs are then analysed by applying data mining techniques, or otherwise machine learning (Eirinaki and Vazirgiannis, 2003). The purpose of data mining techniques or machine learning is to discover new usage patterns and identify statistical correlations between Web pages and user groups (Eirinaki and Vazirgiannis, 2003).

2.4.3 Content Management

Content management is a necessary and crucial procedure in Websites where the content is constantly updated or increased, as for instance in a news Website. In this stage, the content of a Website is broken down into semantic categories in order to facilitate user's navigation (Eirinaki and Vazirgiannis, 2003).

2.4.4 Website publishing

This stage involves the delivery and presentation of the dynamically generated content which is stored locally in a Web server and/or retrieved from other external Web resources using Web technologies (Eirinaki and Vazirgiannis, 2003).

2.4.5 Information Acquisition and Searching

Information acquisition and searching phase is required when the content presented in a Website is not always stored locally in the Website's server. Therefore, Website editors are responsible for searching the Web, selecting the appropriate for each group of users content and then classifying it into thematic categories. This process allows users to view content which is relevant to their interests (Eirinaki and Vazirgiannis, 2003).

2.5 User profiling

Data about the user can be 'obtained either explicitly...or implicitly' (Eirinaki and Vazirgiannis, 2003 p. 5). Registration form and questionnaires are the way of obtaining user information explicitly. On the other hand, monitoring the navigational behaviour of the user or cookies technology are among the implicit ways of obtaining information. When implicit technique is employed, user profiles are created either for each user individually or for a group of users that share similar user data (for example, preferences and navigational behaviour) (Eirinaki and Vazirgiannis, 2003). Web usage mining techniques are applied in order to discover the rules and patterns needed to create user profiles for groups of users (Eirinaki and Vazirgiannis, 2003).

2.5.1 Implicit ways of obtaining information

One of the most popular implicit way of obtaining information is the use of cookies. Websites use cookies in order to identify a user through a session (Eirinaki and Vazirgiannis, 2003). Cookies contain information about a user which are saved as text files in the user's computer while navigating a Website (Eirinaki and Vazirgiannis, 2003). The type of information stored in cookies depends on Website that the user visits. User's identification and password are most common information stored in cookies, yet credit card details, pages visited, purchases made or advertisements selected by the user can be also saved in a cookie (Eirinaki and Vazirgiannis, 2003).

The disadvantage of this method lies on the fact that it is entirely up to the user if she/he wants the cookie to store information (Eirinaki and Vazirgiannis, 2003). That is, cookies store information on the client-side, that is web browser, and not in the database. Therefore, users must have cookies support activated on their web browsers in order for the cookie to successfully store user information (Eirinaki and Vazirgiannis, 2003). However, there are instances where users turn off cookies support on their web browser (Eirinaki and Vazirgiannis, 2003). Furthermore, the fact that cookies are saved as text files in the user's computer allows the user to delete them. As a result, when the user visits the Website again will be treated as a new visitor (Eirinaki and Vazirgiannis, 2003).

Monitoring the navigational behaviour of the user is achieved through the application of Web usage mining techniques (Kanoje, 2015; Eirinaki and Vazirgiannis, 2003). As mentioned above, the goal of Web usage mining techniques is to extract information about the user from Web log files in order to discover new patterns in user's navigational behaviour and interaction with the website (Kanoje, 2015; Eirinaki and Vazirgiannis, 2003).

2.5.2 Explicit ways of obtaining information

As already mentioned, online registration forms and questionnaires is the means of requesting information about the user in an explicit way (Kanoje, 2015; Eirinaki and Vazirgiannis, 2003). Although the information requested from the user depends on the type of Website, user's name, age, sex and preferences are most commonly requested in registration forms (Kanoje, 2015; Eirinaki and Vazirgiannis, 2003). In contrast to the implicit technique mentioned above, in explicit technique the information obtained is stored in a database and depending on which user logs into the Website, the information is updated accordingly (Kanoje, 2015; Eirinaki and Vazirgiannis, 2003). Similar to cookies technique, the disadvantage of this technique is that user is in control of what information she/he wants to store allowing her/him to provide false data, which result to the system returning irrelevant results to this user (Kanoje, 2015; Eirinaki and Vazirgiannis, 2003).

3 Planning and development of the Personalised Health & Fitness Web Application

3.1 Software Development Life Cycle

The purpose of this section is to describe the application's development life cycle that includes the analysis phase that consists of the user requirements and expectations from the system and use case scenarios, the design phase that consists of mock web pages designs, use case diagrams and database design, the implementation phase that consists of the development of

the web application and testing phase that consists of screenshots showing the user's behavior when navigating the actual website as well as the user journey will be demonstrated using use case diagrams and scenarios.

3.2 Analysis Phase

Prior to the design and implementation of the StarFit web application is the system analysis phase. The purpose of this stage is to gather the requirements in order to have a clear picture of what needs to be designed and implemented (Langer, 2012; TenStep, 2000-2004). This phase includes the specifications of how the system will be function in order to meet both the user's and website administrator's expectations. This stage is crucial as it determines whether the project will succeed in meeting the users' expectations (Langer, 2012; TenStep, 2000-2004).

This section describes the functional requirements of the StarFit web application in terms of *Use Cases*. In Unified Model Language (UML), a *use case* described by a set of steps or *scenarios* that provide information about the interaction between the user and the system (Fawler, 2004). The set of steps or scenarios represent the actions that the user takes when interacting with the system in order to achieve her/his goal (Fawler, 2014). The web application will be developed for two types of users: the administrator, which is the personal trainer, and the users (customers) who are further broken down into *registered* and *non-registered users*.

3.2.1 Website User's Role in the Application

The main goal of this web application is to provide users (customers) with the best possible personal training service that is tailored to their fitness needs and personal preferences. Users must become members of the application in order to be assigned a personal trainer and receive personalized exercise plans tailored to their fitness needs and preferences. Use case scenarios are described below.

To summarise, non-registered users must be able to:

- view information about StarFit Health & Fitness Services when click the website's url
- create a profile through a registration process
- provide their personal and fitness details and preferences
- browse health and fitness articles

whereas registered users must be able to:

- login into and log out of the application
- view, edit and modify their profile
- restore their password in case they forget it
- view exercise plans designed for their fitness level and needs
- view articles that are relevant to their interests
- submit information about their overall progress

Use Case 1

User Goal: Become member of the application

Actors: Non-Registered user

1. User enters the website and reads the content in the landing page and the 'About us' section
2. User indicates she/he wants to register
3. User enters her/his personal details in the registration form (username, email, age, weight, height, fitness aim, fitness level, postcode, preferred coach's gender and articles' interest)
4. User is successfully registered
5. User is redirected to her/his personalised homepage
6. System presents the suggested exercise plan(s) and the percentage of the user's BMI, body fat and lean fat after calculations based on the user's weight, height, age and gender from the registration form
7. User navigates on the menu and clicks the 'Articles' link
8. User views all the articles that are based on her/his preference indicated in the registration form
9. User logs out

Extensions:

- 3a: User enters invalid information in any or all of the fields
- .1: System fails to authorise access to the user
 - .2: System presents error messages to the user asking her/him to re-enter the information in the fields
 - .3: User may re-enter the required information in the form fields or cancel the registration process

Use Case 2

User Goal: Login into the website

Actors: Registered user

Trigger: User indicates that she/he wants to login

Normal Flow

1. User indicates she/he wants to login to the system
2. User enters her/his login details
3. System recognises the user information

4. User is redirected to her/his homepage

Extensions:

3a: System fails to recognise the user details

- .1: User may re-enter her/his login details, cancel or indicate that she/he forgot her/his login details

3.2.2 Website Administrator's Role in the Application

The website administrator (admin user) can be either a personal trainer (PT) or manager or any other user with privileges. Admin user's role is to be able to login to the CMS in order to view, manage both admin and registered users as well as view reports regarding users' age, location, gender and preferred personal trainer's gender.

In the users report page on the CMS, the website administrator must be able to view statistics about the age range, gender, location and the period of registration of the registered users. These statistics are highly important from a business perspective since they will help the admin user or the managers to make decisions about the services that they will provide in order to suit all the users' needs. Firstly, statistics regarding the users' location may help the business to decide what the most popular areas are for opening a fitness centre or new branch or hiring more personal trainers in order to serve customers of those popular areas. Secondly, the period of user registration provides information about most popular season that people exercise.

These statistics are also very important since they allow managers to hire the right amount of personal trainers for each season in advance in order to provide service to all users. Thirdly, the age statistics may help the personal trainers to plan workout plans and provide advice that are tailored and suitable to users' age groups. Also, knowing the most popular age group of the registered users can help the managers to adjust the facilities of the fitness centre to the users' needs, preferences or trends based on the age. For instance, low intensity group exercise classes and a lounge area playing vintage music with staff offering hot beverages may be an attractive environment for elderly people. On the other hand, advanced exercise classes that require a lot of energy and power with loud popular music on the background is an environment which may interest younger users between 20-30 years of age. Lastly, the gender of the users along with their preferred coach's gender may potentially provide valuable indications about the relationship between the two genders in a health and fitness setting. In this way, managers will be able to decide as to how many female and male personal trainers they need to hire in order to keep all customers satisfied. As a result in the admin users page website administrators must be able to view the number of female and male personal trainers as well as their area of specialty of each personal trainer which may be weight loss, body strength, exercises for body and mind, nutrition, e.t.c.

To summarise, the website administrator must be able to:

- login to the content management system (CMS)
- view admin users and all registered users of the application

- able to filter users based on name, age, gender, location and preferred coach's gender
- add, edit and delete registered users
- add, edit and delete content including articles and exercise plans

Use Case 1

User Goal: View and manage the users (customers) that are registered in the website

Actors: Admin user

1. Admin user enters the website's url and lands on the login page
2. Admin user enters her/his credentials
5. Admin user is redirected to the registered users page
6. Admin user views personal and fitness information of each registered user
7. Admin user is able to filter the registered users based on username, gender, age, fitness level, fitness aim and location
8. Admin user clicks on the 'User Reports' link
9. Admin user views reports about the most popular period of user registrations, gender, age, location and user's preferred personal trainer's gender
10. Admin user logs out

Extensions:

- 3a: Admin user enters invalid information on the login form
 - .1: System fails to authorise access to the user
 - .2: System presents error messages to the user asking her/him to re-enter the information in the fields
 - .3: Admin user may re-enter the required information in the form fields or cancel the login process
- 6a. Admin user adds a new user
- 6b. Admin user edits an existing user
- 6c. Admin user deletes an existing user

Use Case 2

User Goal: View and manage admin users

Actors: Admin user (Personal Trainer (PT) or non-PT)

1. User enters the website's url and lands on the login page
2. User enters her/his credentials
5. User is redirected to the admin users homepage
6. User clicks on the link 'Admin Users Management'
7. The system presents a table with all the website administrators including personal trainers and managers

7. User views information about admin users, such as first name, last name, gender, age, role (either PT or non-PT) and area of specialty (for PTs only)

8. User is able to filter the users based on their role which is either PT or non-PT, gender and area of specialty

9. User logs out

Extensions:

3a: Admin user enters invalid information on the login form

.1: System fails to authorise access to the user

.2: System presents error messages to the user asking her/him to re-enter the information in the fields

.3: User may re-enter the required information in the form fields or cancel the login process

6a. User adds a new admin user

6b. User edits an existing admin user

6c. User deletes an existing admin user

3.3 Design Phase

The purpose of this phase is to define the design specifications and the system architecture of the web application (Langer, 2012; TenStep, 2000-2004). The design phase includes the production of designs mockups of the web pages and use case diagrams that demonstrate the functionalities of the system based on the requirements identified in the analysis phase (Langer, 2012; TenStep, 2000-2004). The database design is also defined in this phase in the form of logical and physical designs (Oracle, 2000; TenStep, 2000-2004).

3.3.1 Website Design Mockups

The following designs are based on the requirements defined in the analysis phase and have produced as a guidance for the real web pages during the implementation phase.

Landing Page

The landing page is the first page the user views when enters the website. In this page includes information about the services that StarFit website provides along with the *register* and *login* buttons that allow the users to become members or revisit their personal page.

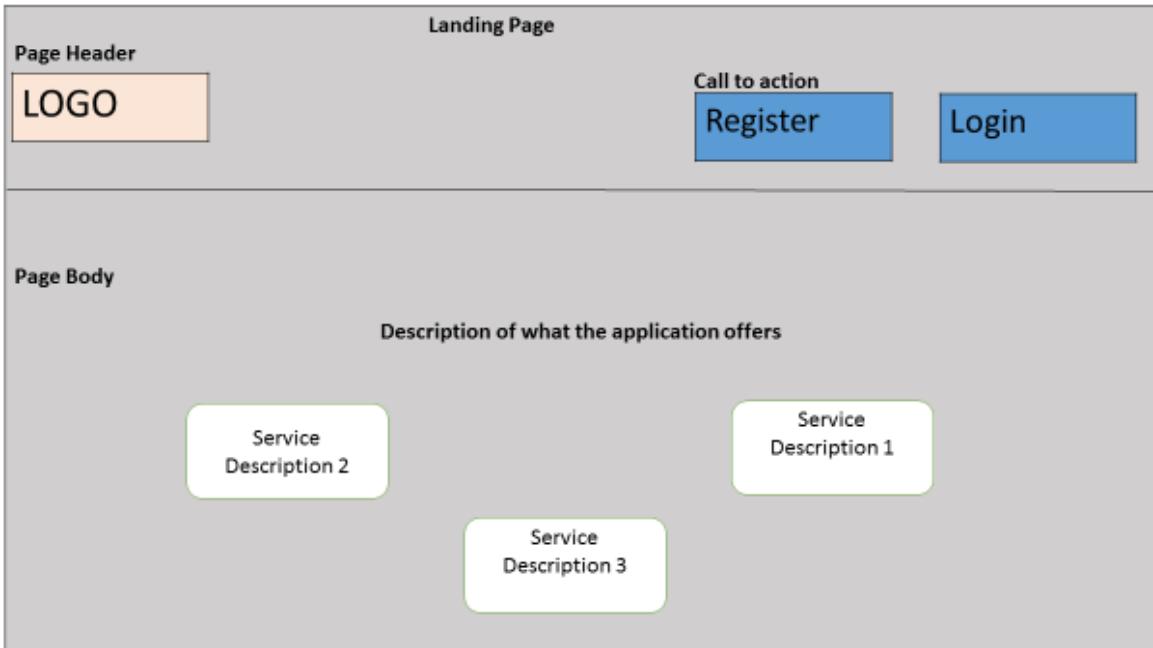


Figure 1 - Landing Page Mockup

Registration Form

There are several methods and techniques that can be implemented in order to achieve web personalization. The personalisation method that is followed for StarFit web application is the process of user profiling by utilising explicit methods such as online forms to obtain information from the user (see personalisation section above). Therefore, the user registration process is a necessary part of the StarFit web application. When click the *register* button, the user will be presented with a popup modal which includes the registration form divided into three steps. The user can move to the next step when click the *next* button. In case the user enters invalid information error messages appear below the form in red colour. It is worth noting that the call to action button is placed at the right of the form. Both the red colour messages and the colour and place of the CTA button contribute to a better user experience. All the form fields need to be completed by the user in order to proceed to the next step.

User Registration Form – Step 1

Username	
Email	
Password	
Place of Residence	

Validation error message

Call to action button

Next

User Registration Form – Step 2

Age	
Gender	
Height	
Weight	

Validation error message

Call to action button

Go back Next

User Registration Form – Step 3

Fitness Aim	
Fitness Aim	
Preferred Personal Trainer's Gender	

Validation Error message

Call to action button

Go back Create Profile

Figure 2 – User Registration Form Mockup

Homepage – Exercise Plan

If the registration is successfully completed, the user's profile is created, the user is redirected to the homepage where she/he can view her/his personalized exercise plan, body fat percentage and body mass index (BMI) details as well as articles and more plans by clicking the

relevant links. In the exercise plan table there is a progress column where the user can tick the box when she/he has completed the programme for the corresponding week.

The mockup shows a user homepage with a header containing a logo, logout, and edit profile buttons. Below the header is a navigation bar with 'Articles', 'More Plans', and 'Personalised Exercise Plan' buttons. The main content area is titled 'Personalised Exercise Plan' and contains a table with columns for Day 1 through Day 7 and Progress. To the right of the table is a 'BMI and Body Fat %' section with current and ideal values for BMI and body fat. At the bottom of the content area is a note 'Tick boxes'.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Progress
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>
							<input type="checkbox"/>

BMI	Body Fat
Current:	Current:
Ideal:	Ideal:

Figure 3 – User Homepage Mockup – Personalised Exercise Plan

Homepage - Articles Section

By clicking the 'Articles' link, the header, footer and the navigation menu remain in their position and only the body of the page will change in order to show articles along with their source to the user.

The mockup shows the user homepage with the 'Articles' section selected. The main content area displays three articles with titles, bodies, and links to sources. Each article is presented in a box with an image placeholder.

Article Title 1	Article Title 2	Article Title 3
Article Body 1	Article Body 2	Article Body 3
Link to Article Source 1	Link to Article Source 2	Link to Article Source 3

Figure 4 – User’s Homepage Articles View Mockup

Edit Profile Form

Similar to the registration page structure, when the user clicks on the ‘*Edit Profile*’ button, a popup modal will appear with form fields for the user to complete. The form fields are not mandatory to be completed by the user but require valid (username, email, password and numeric value in height and weight) and not duplicated information (the username or email may already exist).



The mockup shows a modal window titled 'Edit Profile'. It contains six input fields arranged in two columns of three: 'Username' and 'Height' in the top row, 'Password' and 'Fitness Aim' in the middle row, and 'Weight' and 'Fitness Level' in the bottom row. Below these is a single input field for 'Place of Residence'. To the right of the 'Fitness Aim' field, the text 'Validation Error message' is displayed in red. At the bottom right, there is a 'Call to action button' section containing a blue 'Go back' button and a green 'Next' button.

Figure 5 – Edit Profile Mockup

Login Form

Back to the landing page, when the user clicks on the *login* button, a popup modal will appear consisting of input fields for the user to enter his/her credentials. When the authorization is complete, the user is redirected to the homepage.

User Login Form

Username

Password

Validation error message

Call to action button

Login

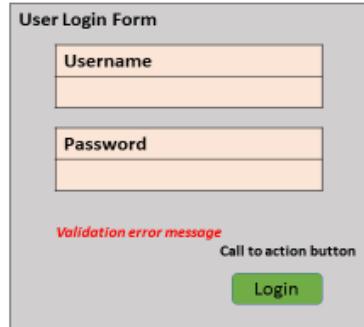
A wireframe mockup of a User Login Form. It features a light gray header bar with the title "User Login Form". Below this are two input fields: "Username" and "Password", each consisting of a label and a rectangular input box. A red italicized text "Validation error message" is positioned between the input fields. At the bottom right is a green rounded rectangle labeled "Login". Above the "Login" button is the text "Call to action button".

Figure 6 – User Login Form Mockup

3.3.2 CMS Design Mockups

The first page the website administrator will see when enters the CMS's link is the login form which is designed in the same way as the user's login form described above.

Admin Login Form

Username

Password

Validation error message

Call to action button

Login

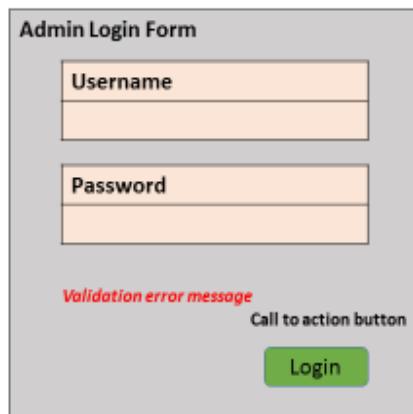
A wireframe mockup of an Admin Login Form, identical in structure to the User Login Form. It has a light gray header bar with the title "Admin Login Form". Below are two input fields: "Username" and "Password". A red italicized text "Validation error message" is centered below the fields. At the bottom right is a green rounded rectangle labeled "Login". Above the "Login" button is the text "Call to action button".

Figure 7 – Admin Login Form Mockup

Admin Homepage – Users Table View

When the system authorize access through the login process, the admin user is redirected to the admin homepage which has similar design to the user's homepage and consists of all the functions that the website administrator is allowed to accomplish. In this page, the table reflects the database of the web application. The admin is able to view, edit and delete any of the registered users appearing on the table, filter information for particular users when typing in the search field as well as sort user information by any of the columns of the table. From this page, the admin user is able to accomplish other functions including adding a new user, content management and admin users management.

Admin User's Homepage - Users Management																							
Page Header		Content Area																					
Page Header		Content Management				Admin Users Management				Users Management													
Filter User Information																							
Users Table																							
Search users...																							
Username	Email	Place of Residence	Gender	Age	Height	Weight	Fit Aim	Fit Level	Body Fat %	BMI	Actions												
											Edit Delete												
											Edit Delete												
Create New User																							

Figure 8 – CMS – Users Management Table

Edit and Create a New User

When the admin user clicks on the 'Edit' link in the table, a popup modal will appear with a form that allows the admin user to change some or all of user's information. The user is also able to create a new user by clicking on the 'Create New User' button. In the Edit form, the form

field are not required as opposed to the creating a new user form where all the fields are mandatory.

In case the admin user would like to delete a user, a popup modal appears asking for confirmation as in mockup below. The admin user then can either proceed or cancels the process.

Edit User Details Form

Username
Email
Age
Gender
Height
Weight
Fitness Level
Fitness Goal
Place of Residence
Preferred PT Gender

Validation error message

Call to action button

Update

Create New User Form

Username
Email
Password
Gender
Age
Height
Weight
Fitness Level
Fitness Goal
Place of Residence
Preferred PT Gender

Validation error message

Call to action button

Create User

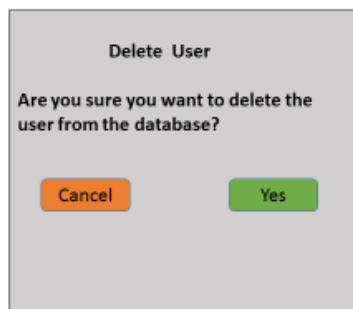


Figure 9 – CMS – Edit Create Delete Mockups

Users Reports View

When the admin user clicks on the ‘*User Reports*’ button, the tables in the page body change and show small different tables with regards to user statistics regarding their age, gender, preferred PT’s gender, location and period that the users’ registered to the Website.

Users Management																			
Page Header	Logout																		
Page Body	Content Management	Admin Users Management	Users Management																
User Reports			<table border="1"><thead><tr><th>Gender</th><th>No. of Users</th></tr></thead><tbody><tr><td></td><td></td></tr></tbody></table>	Gender	No. of Users														
Gender	No. of Users																		
<table border="1"><thead><tr><th>Location</th><th>No. of Users</th></tr></thead><tbody><tr><td></td><td></td></tr></tbody></table>			Location	No. of Users			<table border="1"><thead><tr><th>PT's Gender</th><th>Website User's Gender</th><th></th></tr></thead><tbody><tr><td></td><td>female</td><td>male</td></tr><tr><td>male</td><td>8</td><td>10</td></tr><tr><td>female</td><td>3</td><td>6</td></tr></tbody></table>	PT's Gender	Website User's Gender			female	male	male	8	10	female	3	6
Location	No. of Users																		
PT's Gender	Website User's Gender																		
	female	male																	
male	8	10																	
female	3	6																	
Create New Admin User																			

Figure 10– CMS – Users Reports Tables Mockups

Admin Users Table View

When click on the ‘*Admin Users Management*’ button, the page body changes but the header, footer and the navigation menu remain in their position. In the page below, the admin user is able to view all the admin users (personal trainers and managers) and is able to accomplish the same functions as in the page above.

The mockup shows a user interface for managing admin users. At the top, there's a header bar with a logo, a 'Logout' button, and an 'Edit Profile' button. Below the header is a navigation bar with three tabs: 'Content Management', 'Admin Users Management' (which is highlighted in red), and 'Users Management'. A search bar labeled 'Search users...' is positioned above a table. The table has columns for Username, First Name, Last Name, Email, Age, Gender, Profession, Specialty, and Actions. Each row in the table contains two buttons: 'Edit' and 'Delete'. At the bottom left of the main content area is a red button labeled 'Create New Admin User'.

Figure 11– CMS – Admin Users Table Mockups

The designs for the edit, create and delete an admin user are similar to the ones relating to the edit, create and delete a website user. The only difference is the type of information that is required in the form fields.

Edit Admin User Details Form

Username
First Name
Last Name
Email
Age
Gender
Role
Area of Specialty

Validation error message

Call to action button

Update

Create New Admin User Form

Username
First Name
Last Name
Password
Email
Age
Gender
Role
Area of Specialty

Validation error message

Call to action button

Create User

Delete User

Are you sure you want to delete the user from the database?

Cancel **Yes**

Figure 12– CMS –Edit Create Delete Admin Users Mockups

Looking at the design mockups above, it is worth mentioning that the web pages and forms are based on a particular design pattern. Specifically, the header and the footer always remain in the same position while only the content in the middle of the page changes. Additionally, the forms are chosen to be within popup modals. The reason for this consistency is to avoid confusion and create a pleasant experience to the user when navigating over the different pages. It also needs to be mentioned that the admin user has the ability to create a password when adding a new user to the database. Then the user's responsibility to go to the '*Edit*

'Profile' section when logged into the application and change their password for security reasons.

3.3.3 Database Design

One of the most important aspects of an application is how the stored data are organised. Database structure refers to the organisation of the data that will be stored in the application's database as well as the relationships and constraints between those data. The database development lifecycle is divided into four phases: data requirements establishment, data analysis, and database design and implementation.

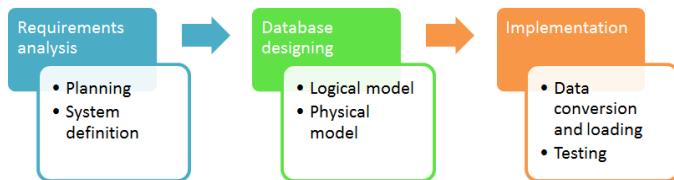


Figure 13 - Database Development Lifecycle²

3.3.3.1 Data Requirements Establishment

The data requirements of a system are determined by the requirements identified in the analysis phase and refer to the type of data that need to be stored in the application's database (Churcher, 2012). Taking into consideration the requirements defined in the analysis phase for this application, the data requirements for the database design of the application include information about the **user** such as *username, email, password, age, gender, weight, height, location and preferred personal trainer's gender*, **user body type** such as *body mass index (BMI), body fat percentage, body type, fitness aim and fitness level, workout plans and articles*. The information about the user is obtained through the registration form, whereas the information for the **user body type** is obtained through calculations made in the programming language that are based on the user's height, weight, age and gender values. There will also be a user id, which will be an incremental numerical value that will be unique for each user in the database. Finally, body type describes the body type category that each user belongs to such as overweight, underweight or normal weight.

² <http://www.guru99.com/database-design.html>

3.3.3.2 Data Analysis

One of the most, if not the most important characteristic of the data analysis phase is the entity-relationship model since it is a reflection of the database of an application. An entity-relationship (ER) model describes the data required by business which is visually represented by an entity-relationship diagrams (Elmasri and Navanthe, 2011). The data in ER model are described as individual modules called entities which are connected with each other via relationships (Elmasri and Navanthe, 2011). Those relationships determine how each entity is dependent on each other, as for instance in StarFit fitness application the **user bodytype** entity is dependent on **users** entity. Entities are real-world objects with properties called attributes (Elmasri and Navanthe, 2011). Entities are the types of data that are required for the implementation of a database, which are defined in the previous phase. It is important to note that, in contrast with the data *values* which will be constantly changing or updated, the *type* of data that is entities, are unlikely to change on a regular basis (Churcher, 2012). To sum up, an entity-relationship model contains all the entities (types of data) and their attributes which are identified in the establishment of data requirements (previous phase) and the relationship between them which are visually represented with entity-relationship diagrams. For instance, in the case of the StarFit fitness web application, users (or client) will be an entity and its attributes will be unique user id, username, email, password, age, gender, weight and height. Furthermore, the unique user id will be a primary key which identifies the particular entity. As mentioned above, ER model is used to describe the database structure of an application. The fitness Web application which is developed for this project uses relational database for its database structure. In relational database the data are stored in tables and their rows represent entities in ER model (Churcher, 2012; Elmasri and Navanthe 2011). There are three levels of ER models including conceptual data model, logical data model and physical data model (Oracle, 1996-2000; Elmasri and Navanthe 2011; AIS, 1997). Each data model has different level of complexity and is represented by a model design. The different levels of complexity are achieved with data abstraction. Data abstraction is the process where details of data are suppressed and only the type of data is highlighted (Elmasri and Navanthe 2011).

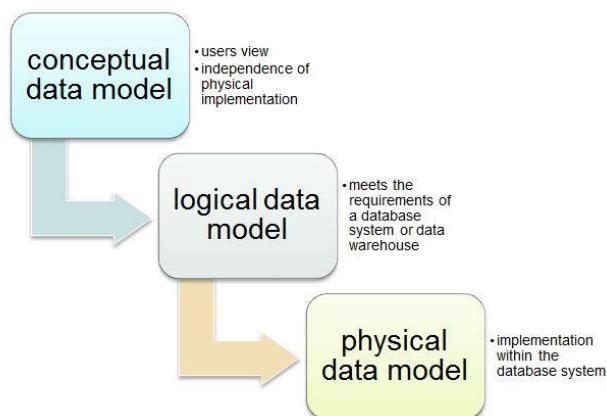


Figure 14 – Data Models³

³ http://www.wikixbrl.info/index.php?title=Guidelines_for_Data_Point_Modeling

3.3.4 Website Structure

Usability is a very important factor to consider when developing a website since it determines the interest that users present when navigating the website (NNG, 2012). Website usability refers to how easy users can interact with the Website such as how quick and easy users find the pages they look for and whether they will be able to use the Website when they return after a period of time (NNG, 2012). Website usability is whole defined by the design and structure of the Website (NNG, 2012). A Website with a good structure and intuitive design makes the user's experience pleasant since they quickly find what they look for. As a result, users will return to the Website on a regular basis therefore the traffic of the Website will increase (NNG, 2012). Website usability is the result of both a good understanding of users' needs and limitations whilst interacting with the Website and taking into consideration business requirements and user expectations (Usability.gov, 2016).

The structure of a website is the way web pages are organised and linked with each other within the website, which is also refer to as *topology* (Brinck et al, 2002). There are various types of website structures including linear (or sequence), hierarchy (or tree) and matrix (or grid) each one having a different purpose according to the Websites needs. The most common topologies or structure types for a Website are presented in the diagrams below (Lynch et al, 2009):

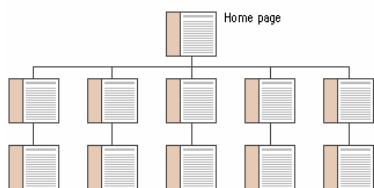


Figure 15 -- Hierarchical Website Structure

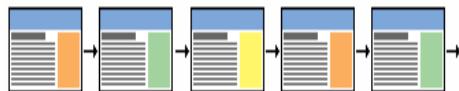


Figure 16 – Linear Website Structure

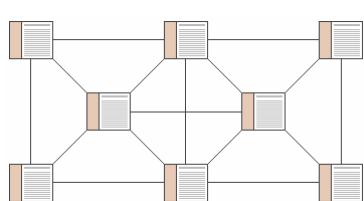


Figure 17 -- Matrix Website Structure

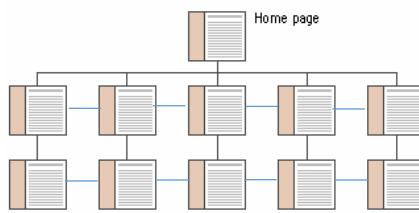


Figure 18 – Hybrid Website Structure

Linear is the structure where web pages are linked together in a sequential order, that is, each web page leads to another web page (Brinck et al, 2002; Lynch et al, 2009). Linear structure is particularly useful when users have to complete a process in a specific order such us a payment process or a training (Brinck et al, 2002; Lynch et al, 2009). On the other hand in hierarchical structure the web pages are all accessible by the homepage which is where the user lands when hitting the website URL (Lynch et al, 2009). Hierarchical structure is the most popular one since it makes website navigation easy for the users (Lynch et al, 2009). The fitness web application that is developed for this project will utilise a combination of hierarchical and linear topology. Specifically, landing page will be the first page the user will view which will lead to either the login or registration page. After logging in or registering, user will be landed to the homepage

where all other web pages will be accessible from. Based on the above, the initial plan of the fitness Web application results to the following website structure tree map:

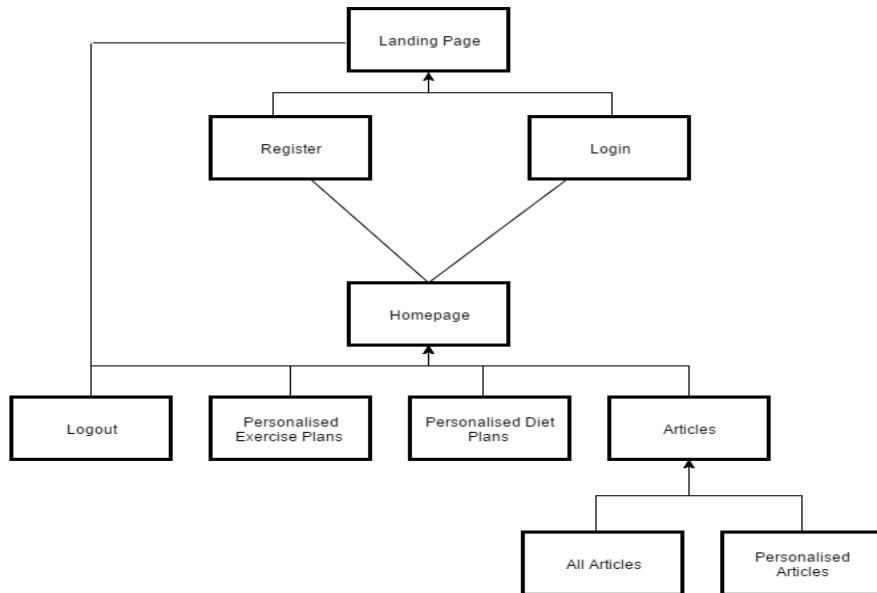


Figure 19 -- StarFit web application structure tree map

3.4 Implementation Phase

The purpose of this phase is to begin the actual development of the system by taking into consideration the requirements defined in the analysis phase and the database and system's designs produced in the design phase. Since the requirements from the system and the user journey have been defined in the previous phases, the main focus of this section is to provide a detailed overview of the programming languages and functions used for developing the web application and its various functionalities as well as the database implementation, in other words the physical database design. Screenshots of the web pages and database tables are provided in order to reflect the functionalities of the system and its database structure.

3.4.1 Programming Languages

3.4.1.1 MySQL

The database of the fitness Web application will be implemented using MySQL database management system. MySQL is a relational database which means that data can be stored in separate tables. There are several benefits in using a relational database management system like MySQL (Welling and Thomson, 2009). In a relational database system the data can be stored in separate tables which facilitates the process of organising and maintaining data. Furthermore, RDBMs provide fast and easy access to the data and can be queried to extract

data according to the web developer's requirements (Gilmore, 2010; Welling and Thomson, 2009). MySQL has been chosen for the database of the fitness web application due to its flexibility, high performance, hyperactive community as well as its availability as an open source database system (Gilmore, 2010). MySQL is a cross-platform database system which means that it can run in any operating system (e.g. Microsoft Windows, Mac OS X, Linux, e.t.c). With regards to performance, MySQL has incorporated a variety of capabilities including enterprise SQL features such as subqueries, views and store procedures, full-text indexing and searching, query caching, replication and security (Gilmore, 2010). Replication is a great advantage for the enterprise since it allows multiple duplications of the MySQL server which results to higher availability (Gilmore, 2010). Security is particularly important for the database of an application and MySQL comes with a lot of security options including managing the number of queries on an hourly basis, requiring SSL certificate to connect to the database and managing what options(e.g. UPDATE, DELETE) are available to the user for a database, table and column (Gilmore, 2010). The reason for choosing MySQL as the DBMS of the fitness application is also based on the fact that there are various extensions that are offered by PHP, therefore their combination has gained great popularity for the development of data-driven and dynamic web applications (Nixon, 2012). PHPMyAdmin will be used for the database implementation since it provides the user interface for managing the administration of MySQL and facilitates the manipulation of data in tables⁴.

3.4.1.2 PHP

PHP stands for Hypertext Processor and is an object-oriented programming language for creating dynamic web applications. PHP5 will be used as the server-side language for developing the fitness web application (The PHP Group, 2016). There are various reasons that make PHP a great programming language for creating dynamic web application. Firstly, PHP is open source programming language which means that there is a great community freely available for support. Secondly, PHP provides several MySQL extensions and drivers that can be used for accessing and working with MySQL (Gilmore, 2010; Robin, 2015; The PHP Group, 2016). Thirdly, PHP is coupled with a vast number of capabilities for developing dynamic web applications including native session-handling which allows tracking users' activity and preferences, encryption algorithms such as MD5 and Blowfish among others which provide the means to secure users' passwords and ISAPI support which provides the ability to use PHP with Apache Web server that is going to be used in the fitness web application (Gilmore, 2010; Robin, 2015).

3.4.1.3 HTML5

HTML5 is a markup language which is a necessary part of any web application or website since it is the language that describes the web pages through the use of markup tags. HTML5 provides a range of powerful features for core functionalities in a web application such as the

⁴ <https://www.phpmyadmin.net>

required attribute which is used in all input field elements to indicate that these elements require input by the user (Robin, 2015).

3.4.1.4 CSS

Cascading Style Sheets is a necessary language for determining how the web pages written in HTML5 are presented on the browser (Robin, 2015).

3.4.1.5 JavaScript, jQuery and AJAX

JavaScript is a programming language used to implement various processes on the client such as form validation and other various effects. In this application jQuery, a JavaScript library is used since it provides more tools to manipulate the DOM elements, add effects as well as makes HTTP requests easier and with few lines of code (Robin, 2015; Duckett, 2014). AJAX techniques are utilized in the application as a means to create asynchronous communication between the web browser and server (Robin, 2015). This means that with AJAX the client (web browser) will be able to send data to the server without requiring the web page to reload, that is, asynchronously which is particularly useful for validating user input (Robin, 2015).

Asynchronous requests to the server, in other words AJAX, are achieved with the use of JavaScript -the XMLHttpRequest object in particular (Robin, 2015). Since StarFit web application is implemented with jQuery, `$.ajax()` function is used in place of the XMLHttpRequest object for creating AJAX request (Duckett, 2014; JQuery, 2016).

To sum up, the above mentioned programming languages are the most popular ones for the development of a dynamic web application (Robin, 2015). MySQL is used for storing and managing the data, PHP manages various processes on the server side, JavaScript along with AJAX techniques allow for data manipulation and exchange between the client and server without the user noticing and HTML and CSS are responsible for the presentation, animations and other effects on the client side (Robin, 2015).

3.4.2 Development Environment

The web application is developed on Windows using WAMP software stack. WAMP refers to a type of software such as XAMPP or WampServer, that can be run locally using Windows as the development environment, Apache as the web server, MySQL as the database management system and PHP as the server side-programming language (Robin, 2015). Therefore, installing this software automatically includes the installation of Apache, PHP and MySQL. For StarFit web application the chosen software for development was XAMPP⁵.

3.4.3 Database and Information Structure

⁵ <https://www.apachefriends.org/index.html>

In the Database Design section, an entity relational model was produced in order to demonstrate the model and define the types of data required for the implementation of StarFit web application (Oracle, 2000). This section describes the implementation, in other words the *physical design* of StarFit's database with MySQL using PHPMyAdmin. The use of MySQL's transaction facility is necessary for the correct sequence and successful completion of queries made throughout the application (Robin, 2015). Therefore, the database will be created using MySQL's **InnoDB** storage engine in order to ensure that the queries happen in the correct order and successfully (Robin, 2015). The types of information required for the implementation of the database of StarFit Web application and defined in the data requirements establishment phase include **users**, **user bodytype**, **workout plans**, **workout exercise** and **articles**. These types of information represent entities in the logical model design process which are transformed into tables during the physical design process (Oracle, 2000). Additional conversions include *relationships* to *foreign keys*, *primary unique identifiers* to the *primary key* and *unique identifiers* to *unique keys* (Oracle, 2000). The tables as well as the process of creating the tables in the StarFit web application database are demonstrated below.

3.4.3.1 Connection to the Database

In order to connect to the database, it is necessary to create a user with privileges that will be able to manage the administration of the database (Robin, 2015). In this case, *root* is the user who connects to *localhost* server and access *fitnessapp_db* database. StarFit is a database driven web application, therefore PHP needs to be able to effectively connect to MySQL to access and manipulate the data (Robin, 2015). For this reason, a file called **dbconnect.php** is created (appendix three) in order to contain the connection to the database which will be required by most of the files in the application (Robin, 2015).

Dbconnect.php file will be included in all files that require access to the database with the function *require_once* PHP statement: *require_once 'dbconnect.php'*. It is worth mentioning that *require_once* statement is the recommended one to use compared to *included* and *require* statements since it ensures that the file will be included only if it was not previously included as well as throw a fatal error if the database is not found (Robin, 2015).

3.4.3.1 Creating the tables

Tables in MySQL contain fields, each one defined by certain types of information including their *Name Type*, *Collation*, *Attributes*, *Null*, *Default* and *Extra*. *Name* refers to the name of the field, *Type* refers to the type of the field, that is, the type of data stored in the field, *Collation* refers to the encoding and the charset used which is always set to UTF-8 (Ishida, 2014), *Attributes* refer to the type of numeric value (unassigned for nonnegative values, binary, e.t.c.) (ORACLE, 2016), *Null* determines whether the field can be empty or not, *Default* refers to a potential default value of the field if no value is specified and *Extra* refers to extra information such as an auto-increment field (Robin, 2015).

There are several Data Types provided by MySQL which are not described here since it is not the purpose of this section. The Data Types that are used for the database of StarFit application are (ORACLE, 2016; Robin, 2015):

`varchar(length)`: any character can be stored with the *length* value to specify the maximum number of characters. The range starts from 0 to 255.

`int(length)`: only integers can be stored from -2,147,483,648 to +2,147,483,647 with the *length* value to specify the maximum number of digits allowed.

`float(M,D)`: floating-point numbers can be stored with the M value to specify the total number of digits and the D to specify the number of digits following the decimal point.

`timestamp`: timestamp values can be stored in the form of '2015/12/22 15:30:80'.

`longtext`: any character can be stored with maximum total number of characters 4,294,967,295.

Users Table

The **users** table represents the entity *users* whereas the fields of the table represent the attributes of the entity users. The fields indicate the type of user information required which is obtained from the users through the registration process. In this table the primary unique identifier, that is, the primary key is the *usr_id* field which holds a numeric and unique *auto_increment* value in order to automatically increase by one when a new record (user) is created and avoid users duplication (Robin, 2015). It is worth mentioning that a field that is used as a foreign key in another table needs to be unique. Therefore, *usr_id* is set as unique to avoid user duplication but also to be used as a foreign key in other tables. Furthermore, the *Attribute* for *usr_id* is set to *unassigned* since zero and negative values are not allowed. Finally, as indicated in the table, all fields need to contain a value (NOT NULL) since they hold necessary information about each user that will be used for the user body type table.

Body_type Table

The **user_bodytype** table contains information about the user's body lean body mass (LBM), body mass index (BMI), body fat percentage, fitness level, body type (underweight, normal-weight, overweight or obese), fitness aim and *usr_id*. The values of the fields are generated through calculations on the server-side. Those calculations are done in PHP using certain field values of the **users** table such as height and weight for BMI and LBM and BMI, age and gender for body fat percentage.

The **id** field is the primary key of the table and holds a numeric *auto_increment* value. The *usr_id* field is the foreign key of the **user_bodytype** table which helps identify the type of information that corresponds to each user.

Articles Table

The **articles** table contains all the articles that are delivered to the user. Each record is dynamically inserted by the website administrator through the content management system. The data type of the **article_body** field is *longtext* in order to be able to store a large number of characters that article normally consist of. **Article_id** is the primary key of the table and **article_category** refers to the category that each article belongs to.

Workout_plans and workout_exercises Tables

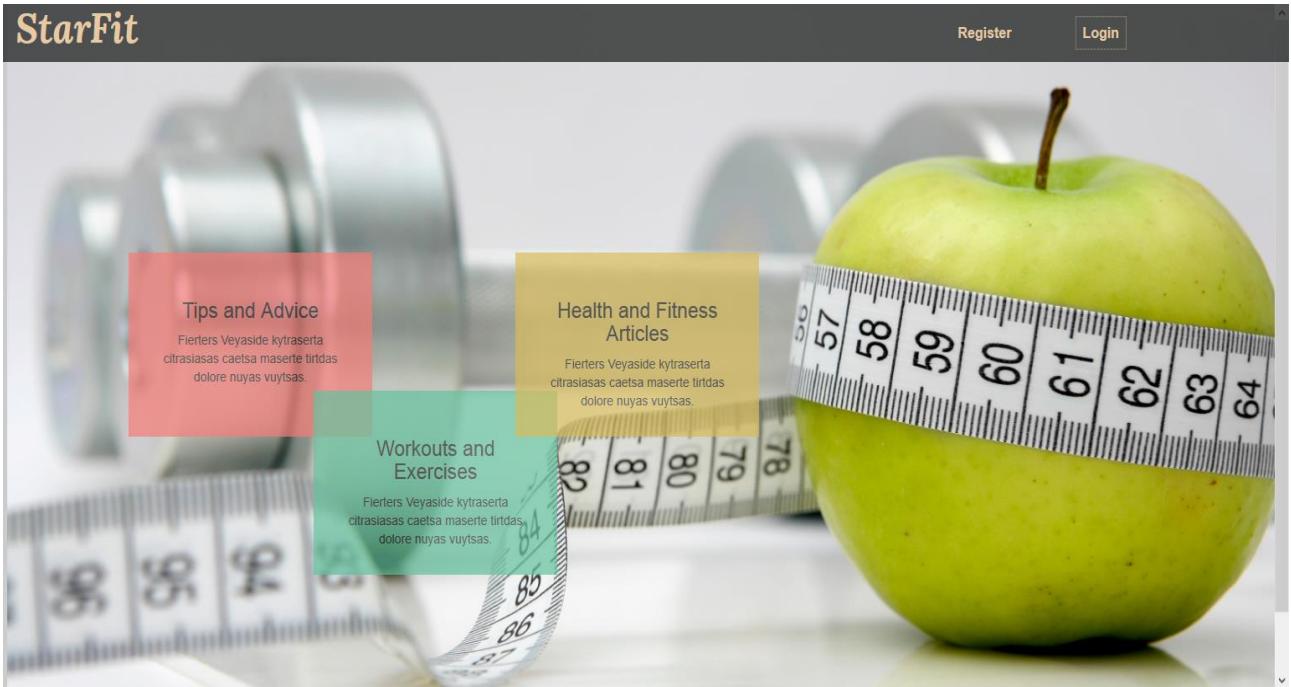
Similar to articles table, the records in both *workout_plans* and *workout_exercises* tables are dynamically inserted by the website administrator through the content management system. **Plan_id** is the primary key that holds a unique and numeric *auto_increment* value. Furthermore, **plan_category** field refers to the categories of each plan such as weight-loss, strength and muscle and endurance. These categories are predefined and correspond to the users' aims in *user_bodytype* table. In this way, when the user sets her/his aim in the registration form, she/he will be able to view the most relevant plans and exercises that match her/his aim. Similarly, **plan_level** field describes the level of difficulty of each plan. The levels are also predefined and correspond to the user's fitness levels in *user_bodytype* table. Therefore, when the user selects her/his level during the registration form, she/ he will be provided with the most appropriate plan according to her/his level.

3.4.4 Core Functionalities of the Website

3.4.4.1 User Registration

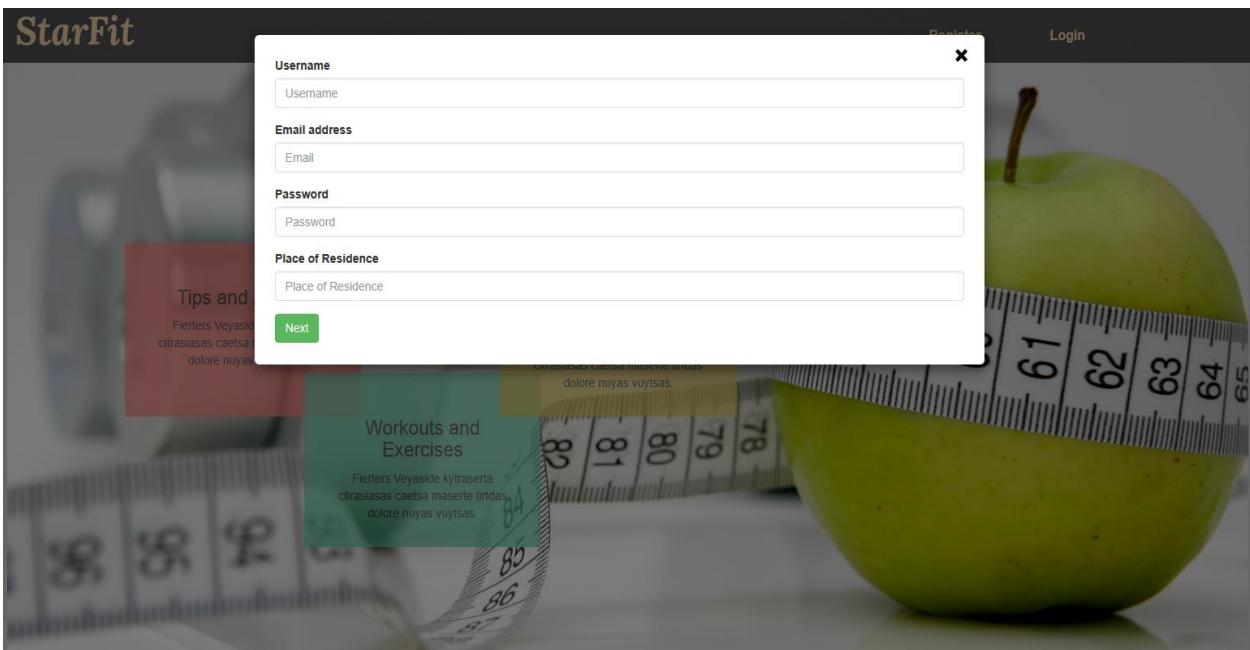
As mentioned in the literature review, *user profiling* is central in the process of building a usage-based personalised web application (Eirinaki and Vazirgiannis, 2003). The aim of user profiling is to collect information about from her/his profile. Such information can be then used by the system in order to modify the contents of the website to be tailored to the user's individual preferences and needs (Eirinaki and Vazirgiannis, 2003). In order to create a base with all the necessary user information can be achieved either in an implicit with the use of cookies or sessions among others, or explicit way via using registration forms (Eirinaki and Vazirgiannis, 2003). In Starfit web application the explicit way of collecting user information is used. Therefore, the need for a registration process that allows the user to create a profile becomes necessary. This is achieved by creating a registration form where users can provide their personal details and preferences in order for the application to deliver content based on this information.

The landing page is the first page the user sees when enters the website's url:



ScreenShot 1 – Landing Page

The registration form is accessed by clicking on the '*Register*' link at the right corner, where a popup modal appears divided into three steps asking the user different information in each step:



ScreenShot 2 – Registration Form (step 1)

Age

Gender Female Male

Height

Height in inches

Weight

Weight in Pounds

Go Back

Next

ScreenShot 3 – Registration Form (step 2)

Fitness Level Beginner Intermediate Advanced

Fitness Goal Loose Weight Gain Strength and Muscle I am Not Sure Yet

Preferred Personal Trainer's Gender Female Male

Cancel Go Back Create Profile

ScreenShot 4 – Registration Form (step 3)

In StarFit web application, the registration form is implemented with PHP and JavaScript-jQuery. PHP is used to communicate with and send the data to the database, which is MySQL, in order to store users' information. JQuery is used for client-side validation by applying AJAX techniques. AJAX validation is friendlier to the user since it provides immediate feedback without requiring the page to reload when submitting the form. However, server-side validation is necessary since it ensures that secure data are submitted for the cases where JavaScript is turned off or not supported by the user's web browser (Robin, 2015; Boronczyk et al, 2009). As a result, in StarFit web application input validation on both sides is performed. PHP Sessions are implemented and used throughout the application in order to recognise the user's details when she/he logs in and navigates through the web pages. With PHP sessions, the logged in user's details are assigned in session variables which are stored on the server (Robin, 2015). The `session_start()` PHP function indicates the start of a session and `session_destroy()`

the end of the session (Robin, 2015). For instance, `$_SESSION['username'] = $username` is used to store the username that the user provided and `$_SESSION['registered'] = 1` is used to indicate that the user is registered. There are more examples illustrating the use of session variables in the code in the following sections.

Reg-form.php

In the *reg-form.php* (appendix 1), the `action="register.php"` attribute of the form indicates that when the user clicks the ‘Create profile’ button in the form, all the data in the input field entered by the user are retrieved and processed by the *register.php*. Additionally, the attribute `type` of the *register* button has the value `submit` which is necessary in cases where form data are submitted as in this case (W3C, 2011). The `method="post"` attribute specifies the method that the data are transferred, which is `HTTP_POST` (W3SCOOLS, 2016).

Register.php

In the *register.php* (appendix 2), the details that user provides in the input fields are stored in the database using specific PHP functions for security reasons explained in the previous section. Those functions include `mysqli_real_escape_string()` which is used to escape special characters and `md5()` which is used to store the user’s password as a hash string instead of plain text (The PHP Group, 2016). The user’s username, email, password and other information are stored in variables, where `$_POST['username']` is the user’s input and `$conn` refers to the connection to the database which was created in the *dbconnect.php*. The `isset($username)` and `isset($email)` functions determine whether the username and email field, in this case, are empty or not (The PHP Group, 2016). This means that when username and password fields are filled by the user, then the code checks whether there is any record in the *users* table in the database that matches the username or email provided by the user. In case there is at least one record in the database, the registration fails since the user already exists since duplication of users is not allowed. The `exit()` PHP function is used to terminate the script and prevent user from registering (The PHP Group, 2016).

In the `exit(status)` function the *status* in the parentheses is the response from the server which is also sent to the client. If the status is a string, this string is the message printed before exiting; if the status is a number, this number is used as the status of the response yet is not printed (`0` terminates the script without returning anything whereas `1` terminates the script and returns an error code) (The PHP Group, 2016).

In case there is not any record with the same username and email, the code performs server side validations on the input fields. Given that the validation has passed, when the form is submitted which is checked through the `if (isset($_POST['register']))`, function (where *register* is the value of the `name` attribute of the submit button), all the information that the user provides are inserted in the *users* table as a new record using SQL commands. If the connection is successful and the data are inserted into the database, the username as well as the user’s status (registered and logged in) are stored in session variables and the *usr_id* is identified through a query in the *users* table in order to identify user’s gender and calculate the body fat percentage.

The results of the calculations along with the user's aim and level will be stored in the `user_bodytype` table in a row with the same `usr_id` in order to identify the results for each user. The `usr_id` is initially identified based on the username.

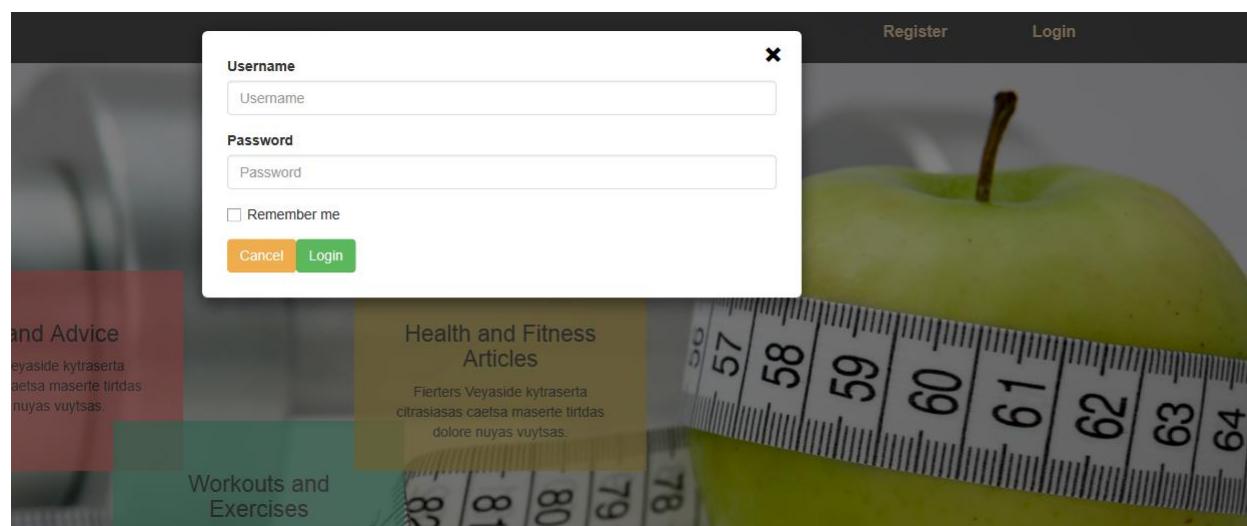
Register-error-handing.js

The error-handling.js (appendix 3) file includes the validation as well as the AJAX request that is sent to the server in order to check whether the username or email that the user enters already exist in the database (Robin, 2015). As it was previously mentioned, using AJAX techniques makes the validation and feedback friendlier and more responsive to the user since the results are immediate without requiring the page to reload (Robin, 2015).

Within the `if..else` conditions, `response` is a variable that refers to the response coming from the server, that is, PHP. As mentioned above, the `status` as in `exit(status)` function corresponds to the `response` that the client receives. In the case of checking if the user exists, when the user enters a value in the username or email an AJAX request is sent to the server which sends the response back to the client. The response coming from the server is stored in the `response` argument of the `success` function.

3.4.4.2 User Authentication

User authentication refers to the user login process where the user needs to provide her/his credentials such as username and password that were provided in the registration form. Authentication is a necessary feature for this web application since it ensures security as well as offer content that is customisable based on the user preferences (Gilmore, 2010; Robin, 2015). Like the registration form, the login form is accessible from the landing page next to the 'Register' link:



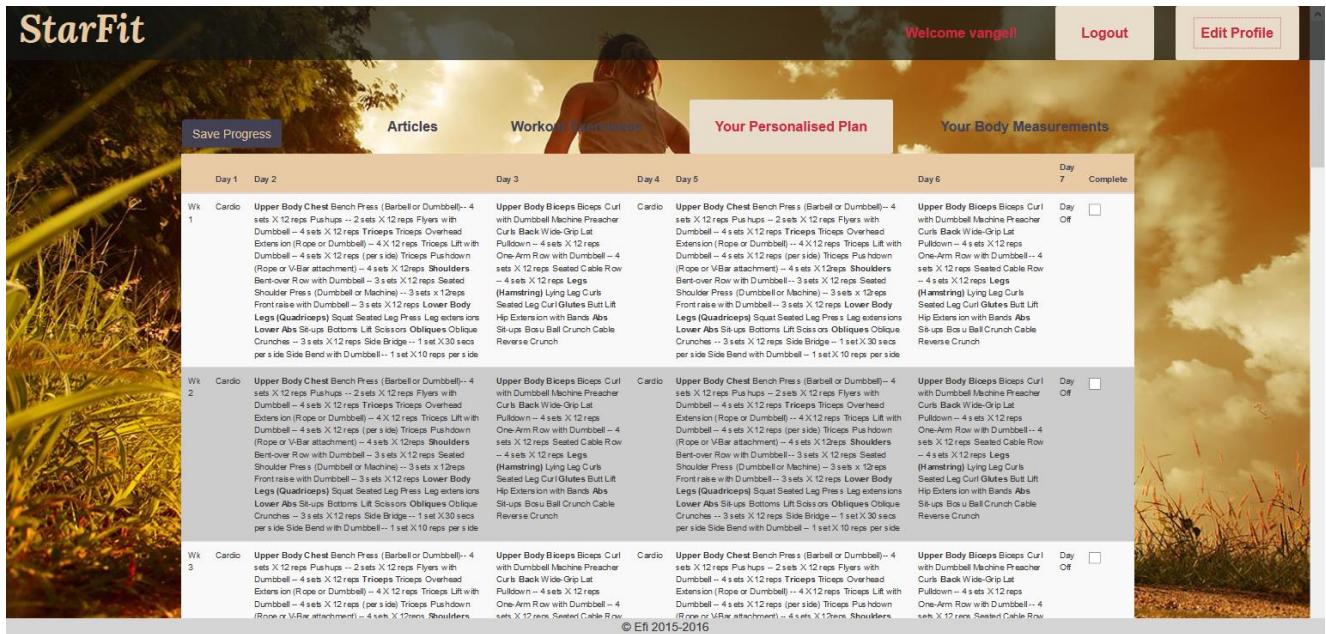
ScreenShot 5 – Login Form

Login-form.php and Login.php

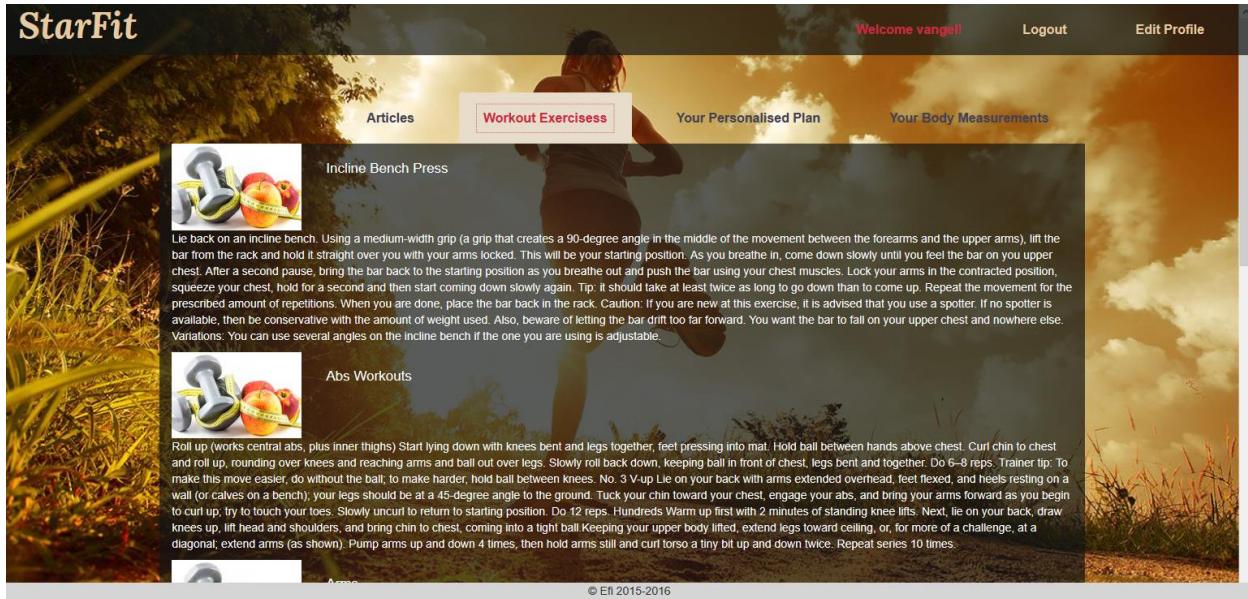
The *login-form.php* (appendix 4) contains the HTML for the form, whereas the *login.php* (appendix 5) contains the PHP code that processes the data sent by the user. The details that the user provides in the login form must be sent in the database in the same format as they were initially stored when the registration was successful. In this file the credentials provided by the user in the login form are checked against the information in the records existing in the database in *users* table in order to authorize or deny access to the user. If the check finds at least one record that matches, then the code checks whether the password of the record found matches the password that the user provided in the login form. If the passwords do not match, the *exit(1)* function is used and deny access to the user, whereas if the passwords match user is directed to the homepage using header ('Location: homepage.php') PHP function (The PHP Group, 2016) and the username is stored in a session variable in order to keep the session for the user.

3.4.4.3 Homepage

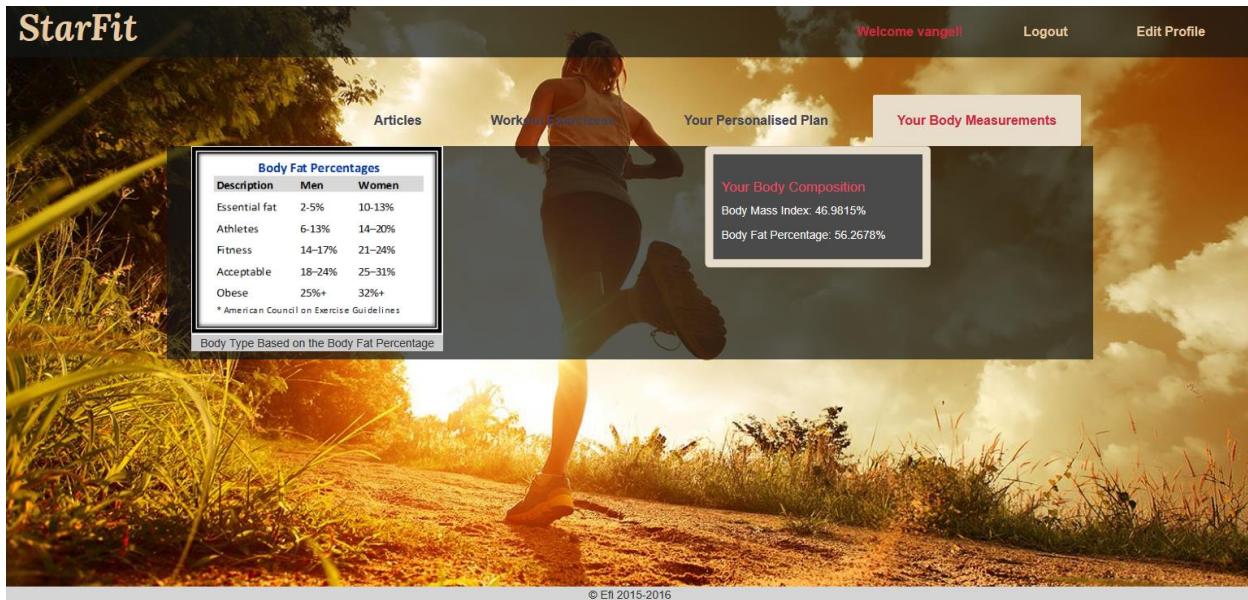
The homepage is where the user is redirected after the registration or the login process is successful which is indicated when the username appears on the header of the page. In these pages the user is able to view her/his personalized workout plan, articles, more workout exercises, information about the user's body type and fat percentage as well as edit her/his profile by clicking on the '*Edit Profile*' link:



ScreenShot 6 – Homepage - Personalised Exercise Plan



ScreenShot 7 – More Exercise Plans

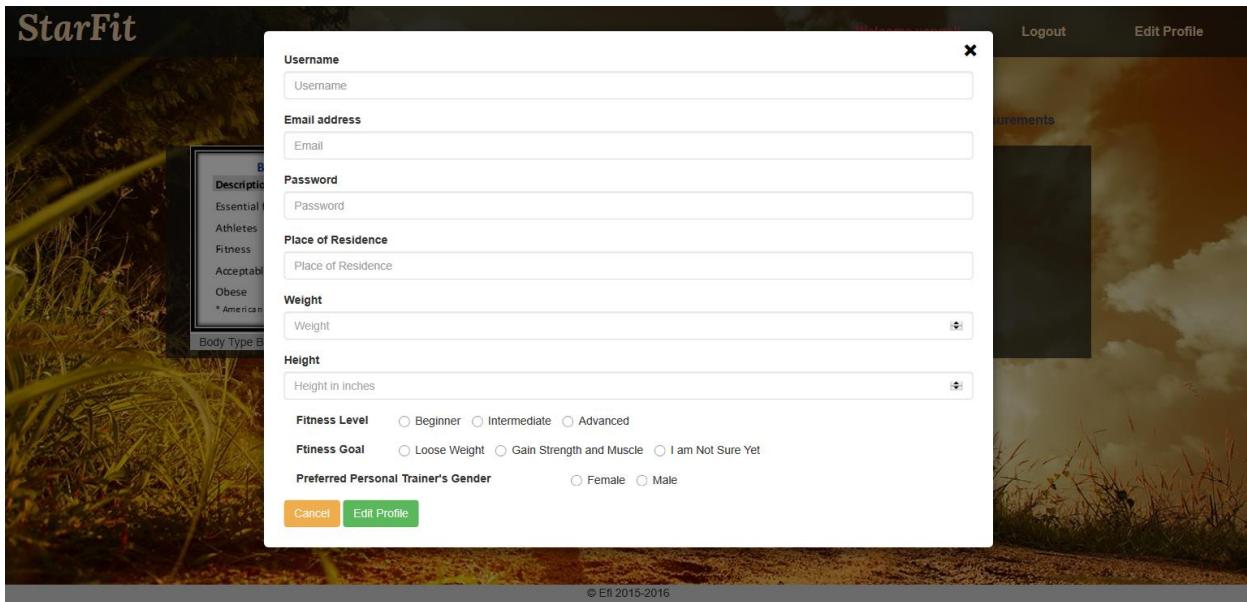


ScreenShot 8 –Body type and fat percentage information

3.4.4.4 Edit Profile

The edit profile functionality allows registered users to update their personal details by clicking the link *Edit Profile* on the homepage. Users are able to update any of their details given that

they are logged into the application. For the edit profile functionality, there are two files created: *edit-form.php* (appendix 6) and *edit-profile.php* (appendix 7). Particularly, *edit-form.php* contains the HTML5 code for rendering the form fields and *edit-profile.php* contains the PHP code to process the updated data. In the *edit-profile.php* (appendix 24), the first step is to check if the username is stored in a session, that is, if the user is logged in. After that, using an SQL query, a check is performed in the *users* table in the database in order to identify whether the user exists. Specifically, all the usernames are returned with an SQL query as a string (line 7) which is then converted into an array with the *explode()* function (line 14). In this way, it can be checked whether the current username exists in the array of usernames (line 18). In case the user does not exist then the script is terminated with the *exit()* function. In order to check whether the user has entered a value so that to avoid sending empty value to the database, the string length of each field value is checked. In case the user's *height* and/or *weight* is changed, the *bodyfat*, *bmi* and *type* values in the *user_bodyfat* table are updated as well since such values are dependent on the user's weight and height. Specifically, calculations for the *bodyfat* and *bmi* values are performed (line 58-97) and the new values are inserted in the *user_bodytype* table (line 99).



ScreenShot 9 –Edit Profile

3.4.4.5 User Categorisation

The purpose of the StarFit web application is to deliver personalised content to the user based on their body type, their fitness aim and their current fitness level. The body type is determined by their body mass index and the percentage of fat they have in their body. The body fat percentage can be calculated based on a formula invented by D which uses the user's gender,

age and body mass index (BMI) whereas BMI is calculated using the user's weight and height. Weight can be either in inches or kilograms whereas height can be either in metres or inches. In this case, pounds and inches are used. Furthermore, the calculation of the body fat percentage, gender value is 1 for males and 0 for females. (Deurenberg, Weststrate and Seidell, 1991; CDC, 2015;):

$$\text{BMI\%} = (\text{weight} / \text{height} * \text{height}) * 703$$

$$\text{BF\%} = (1.20 \times \text{BMI}) + (0.23 \times \text{age}) - (10.8 \times \text{gender}) - 5.4$$

Based on American Council on Exercise recommendations illustrated in the table below, the percentage of body fat determines the category of body type the user is. Yet, the range of body fat percentage is different between males and females (ACE, 2009). Following the code in PHP, the `$type` variable is used to represent the user body type category. Once the `$type` has been identified, it is stored along with other user details (including level and aim provided by the user) in the `user_bodytype` table using SQL command (appendix 8).

Body Fat Percentage Categories

Body Type Category	Women	Men
Essential Fat	10-13%	2-5%
Athletes	14-20%	6-13%
Fitness	21-24%	14-17%
Average	25-31%	18-24%
Obese	> 32%	> 25%

The content delivered to each user is based on their level, aim and body type values. This is achieved by creating SQL commands and PHP conditions that check the level, aim and body type values of the user through her/his `usr_id` in order to find the workout plan(s) and articles that correspond to such values (appendix 9).

3.4.4.6 Submit Progress

The user is also able to submit her/his progress by ticking the checkboxes for each week on the exercise plan table. This information is then stored in the database in the `user_score` table which keeps track of the user's progress so that the workout plans presented to the user reflect her/his level (appendix 10).

The screenshot shows a personalized fitness plan interface. At the top, there are two tabs: "Your Personalised Plan" and "Your Body Measurements". Below these are three columns representing different days of the week: Day 4, Day 5, and Day 6. Each day has a list of exercises and their descriptions. To the right of Day 6 is a column for "Day 7 Complete" which includes a checkbox labeled "Off".

	Day 4	Day 5	Day 6	Day 7	Complete	
Curl cher	Cardio	Upper Body Chest Bench Press (Barbell or Dumbbell) - 4 sets X 12 reps Pushups - 2 sets X 12 reps Flyers with Dumbbell - 4 sets X 12 reps Triceps Triceps Overhead Extension (Rope or Dumbbell) - 4 sets X 12 reps Triceps Lift with Dumbbell - 4 sets X 12 reps (per side) Triceps Pushdown (Rope or V-Bar attachment) - 4 sets X 12 reps Shoulders Bent-over Row with Dumbbell - 3 sets X 12 reps Seated Shoulder Press (Dumbbell or Machine) - 3 sets X 12 reps Front raise with Dumbbell - 3 sets X 12 reps Lower Body Legs (Quadriceps) Squat Seated Leg Press Leg extensions Lower Abs Sit-ups Bottoms Lift Scissors Obliques Oblique Crunches - 3 sets X 12 reps Side Bridge - 1 set X 30 secs per side Side Bend with Dumbbell - 1 set X 10 reps per side		Upper Body Biceps Biceps Curl with Dumbbell Machine Preacher Curls Back Wide-Grip Lat Pulldown - 4 sets X 12 reps One-Arm Row with Dumbbell - 4 sets X 12 reps Seated Cable Row - 4 sets X 12 reps Legs (Hamstring) Lying Leg Curls Seated Leg Curl Glutes Butt Lift Hip Extension with Bands Abs Sit-ups Bicep Curl Crunch Cable Reverse Crunch	Day Off	<input type="checkbox"/>
I - 4 Row						
Lift s ble						
Curl cher	Cardio	Upper Body Chest Bench Press (Barbell or Dumbbell) - 4 sets X 12 reps Pushups - 2 sets X 12 reps Flyers with Dumbbell - 4 sets X 12 reps Triceps Triceps Overhead Extension (Rope or Dumbbell) - 4 sets X 12 reps Triceps Lift with Dumbbell - 4 sets X 12 reps (per side) Triceps Pushdown (Rope or V-Bar attachment) - 4 sets X 12 reps Shoulders Bent-over Row with Dumbbell - 3 sets X 12 reps Seated Shoulder Press (Dumbbell or Machine) - 3 sets X 12 reps Front raise with Dumbbell - 3 sets X 12 reps Lower Body Legs (Quadriceps) Squat Seated Leg Press Leg extensions Lower Abs Sit-ups Bottoms Lift Scissors Obliques Oblique Crunches - 3 sets X 12 reps Side Bridge - 1 set X 30 secs per side Side Bend with Dumbbell - 1 set X 10 reps per side		Upper Body Biceps Biceps Curl with Dumbbell Machine Preacher Curls Back Wide-Grip Lat Pulldown - 4 sets X 12 reps One-Arm Row with Dumbbell - 4 sets X 12 reps Seated Cable Row - 4 sets X 12 reps Legs (Hamstring) Lying Leg Curls Seated Leg Curl Glutes Butt Lift Hip Extension with Bands Abs Sit-ups Bicep Curl Crunch Cable Reverse Crunch	Day Off	<input type="checkbox"/>
I - 4 Row						
Lift s ble						
Curl cher	Cardio	Upper Body Chest Bench Press (Barbell or Dumbbell) - 4 sets X 12 reps Pushups - 2 sets X 12 reps Flyers with Dumbbell - 4 sets X 12 reps Triceps Triceps Overhead Extension (Rope or Dumbbell) - 4 sets X 12 reps Triceps Lift with Dumbbell - 4 sets X 12 reps (per side) Triceps Pushdown (Rope or V-Bar attachment) - 4 sets X 12 reps Shoulders Bent-over Row with Dumbbell - 3 sets X 12 reps Seated Shoulder Press (Dumbbell or Machine) - 3 sets X 12 reps Front raise with Dumbbell - 3 sets X 12 reps Lower Body Legs (Quadriceps) Squat Seated Leg Press Leg extensions Lower Abs Sit-ups Bottoms Lift Scissors Obliques Oblique Crunches - 3 sets X 12 reps Side Bridge - 1 set X 30 secs per side Side Bend with Dumbbell - 1 set X 10 reps per side		Upper Body Biceps Biceps Curl with Dumbbell Machine Preacher Curls Back Wide-Grip Lat Pulldown - 4 sets X 12 reps One-Arm Row with Dumbbell - 4 sets X 12 reps Seated Cable Row - 4 sets X 12 reps Legs (Hamstring) Lying Leg Curls Seated Leg Curl Glutes Butt Lift Hip Extension with Bands Abs Sit-ups Bicep Curl Crunch Cable Reverse Crunch	Day Off	<input type="checkbox"/>
I - 4 Row						
Lift s ble						

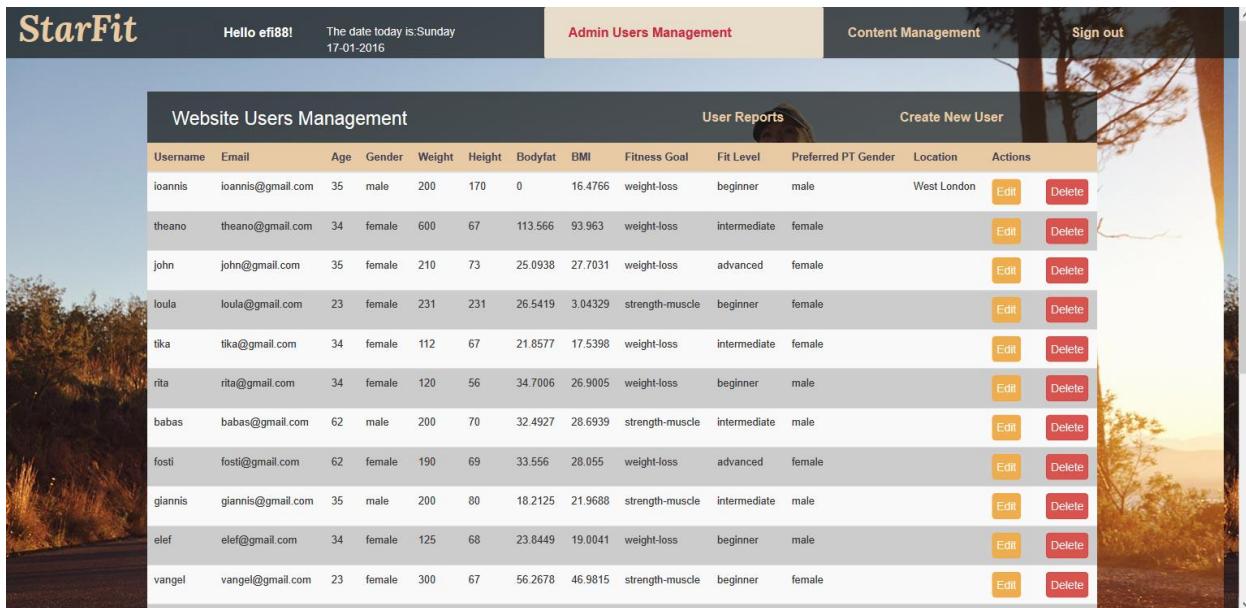
ScreenShot 10—Progress Checkboxes

3.4.5 Core Functionalities of the Content Management System (CMS)

A content management system (CMS) is software developed with the aim to enable users and organisations to access and manage the content as well as users of a website through their web browser (Beal, 2016). There are various content management systems that can be configured to work in with any website as long as the website and the CMS share the same server-side language. Examples of popular CMSs written in PHP include WordPress, Blogger, Drupal and Joomla (BuiltWith). In this project, a custom content management system will be developed for StarFit website. The CMS is a tool created to allow website administrators (admin users) including personal trainers (PT) and managers to manage the content and users of the website as well as view reports about the users registration date, location and preferences. In order to avoid confusion as well as authorizing access to wrong users, the *admin_users* table is created in the database which includes only the website administrator users. Users other than website administrators are not granted access to the CMS since they do not have control over the website content as well as other users' information.

The complete code of the content management system sits in *cms* folder within the project which is distributed into *admin*, *customers* and *content* folders. Initially, the website administrator needs to login into the CMS by entering a different URL from the website's URL. A welcome message appears on the header of the page when the user authentication is

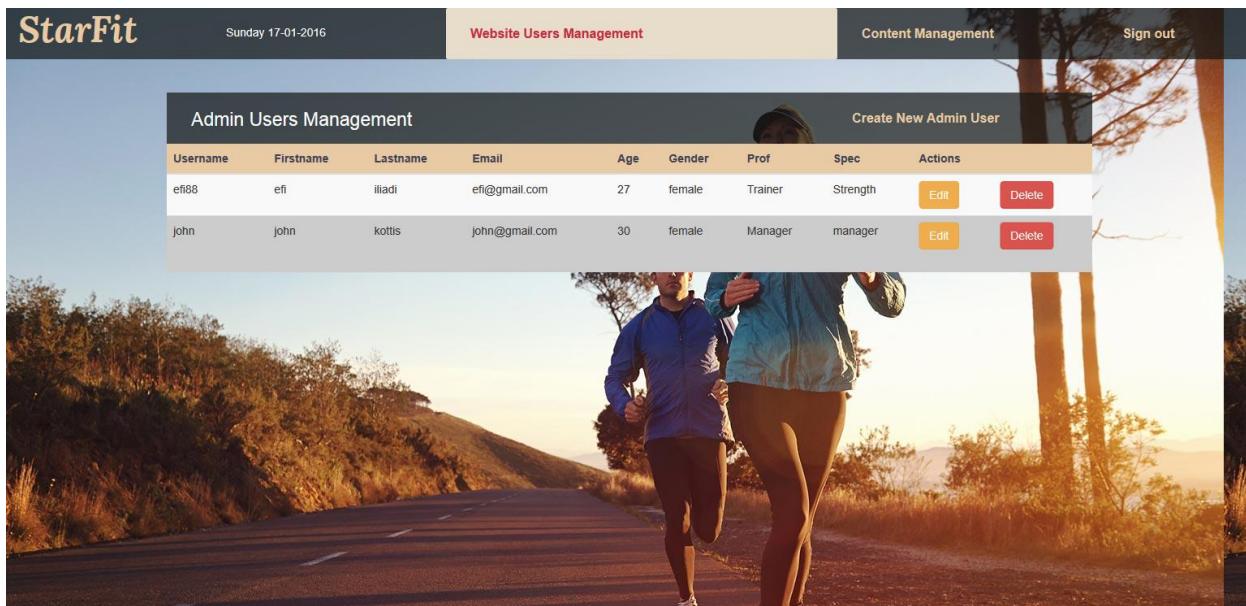
successful. After logging in, the admin user is redirected to the homepage where she/he can see view and manage the website as well as admin users and the content of StarFit web application by clicking the *User Management* or *Content Management* link respectively. The *Website Users Management* and *Admin Users Management* sections allow the website administrators to view, create new, update the details or delete website users (customers).



The screenshot shows the StarFit homepage with a header bar containing "StarFit", "Hello efi88!", "The date today is:Sunday 17-01-2016", "Admin Users Management" (highlighted in red), "Content Management", and "Sign out". Below the header is a navigation bar with three tabs: "Website Users Management" (highlighted in blue), "User Reports", and "Create New User". The main content area displays a table titled "Website Users Management" with the following data:

Username	Email	Age	Gender	Weight	Height	Bodyfat	BMI	Fitness Goal	Fit Level	Preferred PT Gender	Location	Actions
ioannis	ioannis@gmail.com	35	male	200	170	0	16.4766	weight-loss	beginner	male	West London	<button>Edit</button> <button>Delete</button>
theano	theano@gmail.com	34	female	600	67	113.566	93.963	weight-loss	intermediate	female		<button>Edit</button> <button>Delete</button>
john	john@gmail.com	35	female	210	73	25.0938	27.7031	weight-loss	advanced	female		<button>Edit</button> <button>Delete</button>
loula	loula@gmail.com	23	female	231	231	26.5419	3.04329	strength-muscle	beginner	female		<button>Edit</button> <button>Delete</button>
tika	tika@gmail.com	34	female	112	67	21.8577	17.5398	weight-loss	intermediate	female		<button>Edit</button> <button>Delete</button>
rita	rita@gmail.com	34	female	120	56	34.7006	26.9005	weight-loss	beginner	male		<button>Edit</button> <button>Delete</button>
babas	babas@gmail.com	62	male	200	70	32.4927	28.6939	strength-muscle	intermediate	male		<button>Edit</button> <button>Delete</button>
fosti	fosti@gmail.com	62	female	190	69	33.556	28.055	weight-loss	advanced	female		<button>Edit</button> <button>Delete</button>
giannis	giannis@gmail.com	35	male	200	80	18.2125	21.9688	strength-muscle	intermediate	male		<button>Edit</button> <button>Delete</button>
elef	elef@gmail.com	34	female	125	68	23.8449	19.0041	weight-loss	beginner	male		<button>Edit</button> <button>Delete</button>
vangel	vangel@gmail.com	23	female	300	67	56.2678	46.9815	strength-muscle	beginner	female		<button>Edit</button> <button>Delete</button>

ScreenShot 11– Homepage – Website Users Information Table



The screenshot shows the StarFit homepage with a header bar containing "StarFit", "Sunday 17-01-2016", "Website Users Management" (highlighted in red), "Content Management", and "Sign out". Below the header is a navigation bar with three tabs: "Admin Users Management" (highlighted in blue), "User Reports", and "Create New Admin User". The main content area displays a table titled "Admin Users Management" with the following data:

Username	Firstname	Lastname	Email	Age	Gender	Prof	Spec	Actions
efi88	efi	iliadi	efi@gmail.com	27	female	Trainer	Strength	<button>Edit</button> <button>Delete</button>
john	john	kottis	john@gmail.com	30	female	Manager	manager	<button>Edit</button> <button>Delete</button>

ScreenShot 12– Admin Users Information Table

Additionally, there is a '*User Reports*' (screenshot 11) where the admin user can view useful information and statistics about the age, gender and preferred personal trainer's gender of the website users.

The screenshot shows the 'User Reports' section of the StarFit website. At the top, there are navigation links: 'Hello efi88!', 'The date today is Monday 18-01-2016', 'Admin Users Management', 'Content Management', and 'Sign out'. The main content area is titled 'User Reports' and contains four tables:

- Age Statistics** (Table):

Age	Number of Users
23	2
34	5
35	4
56	1
62	2
67	1
- Gender Statistics** (Table):

Gender	Number of Users
female	11
male	4
- Most Preferred PT Gender by Males and Females** (Table):

Trainers Gender	Clients Gender
Female	9
Male	3
- Most Popular Areas** (Table):

Location	Number of Users
Angel	5
Canary Wharf	3
Guildford	4
London	3
- Most Popular Areas** (Table):

Season	Number of Users
May-August	6
September-December	2
January-April	2

ScreenShot 13– User Reports Table

Within the content management section, the website administrators are able to insert new records, update or delete existing ones from the database. The new record is inserted either in the *workout_plans*, *workout_exercises* or *articles* table in the database according to the category the website administrator selects. In case the articles category is chosen, the options in the sub-categories field refer to the topic of the article. In case the Workout Plan or Workout Exercises category is chosen, the options in the sub-category correspond to the user's fitness aim. For instance, users who have set weight-loss as their fitness aim during the registration process will receive the workout plans and exercises that are under the sub-category *Weight-loss*. In a similar vein, the level field refers to the users' level. For instance, beginners will receive the workout plans and exercises that are under the beginner's level in the *workout_plans* and *workout_exercises* tables. As already mentioned in a previous section, the *htmlspecialchars()* PHP function is used to convert special characters to ASCII in order to be inserted with security in the database (The PHP Group, 2016).

StarFit Sunday 17-01-2016 Admin Users Management Website Users Management Sign out

Insert New Article or Plan:

Number of weeks of the plan
 1 2 3 4
 5 6 7 8
 9 10 11 12

Gender Female Male

Category

Sub-category
 Weight-loss Strength-muscle

Level of Workout Beginner Intermediate Advanced

Title

Weekly Plan

ScreenShot 14– Content Management

In the *Website Users Management* section, the admin user is also able to create a new user by clicking on the ‘Create New User’ link as well as edit or delete a user by clicking on the relevant button on the users table:

StarFit Hello ef1bb1 Website Us...

Username	Email
ioannis	ioannis@gr
theano	theano@gr
john	john@gm
toula	toula@gr
tika	tika@gm
rifa	rifa@gm
babas	babas@gr
fotli	fotli@gm
giannis	giannis@gr
elef	elef@gm
vangel	vangel@gr
roula	roula@gr
roma	roma@gr

Add New User Record

Username

Email address

Password

Age

Gender Female Male

Height

Weight

Fitness Level Beginner Intermediate Advanced

Fitness Goal Loose Weight Gain Strength and Muscle I am Not Sure Yet

Preferred Personal Trainer's Gender Female Male

ScreenShot 15– Create New User

StarFit

Hello eff88!

Website Users Management

Username	Email
ioannis	ioannis@gmail.com
theano	theano@gmail.com
john	john@gmail.com
loula	loula@gmail.com
tika	tika@gmail.com
rita	rita@gmail.com
babas	babas@gmail.com
fostl	fostl@gmail.com
giannis	giannis@gmail.com
elef	elef@gmail.com
vangel	vangel@gmail.com
roula	roula@gmail.com
rma	rma@gmail.com

Sign out

Edit User Information

Username
New Username

Email
New Email

Age
New Age

Place of Residence
Place of Residence

Gender Female Male

Height
New Height

Weight
New Weight

Fitness Level Beginner Intermediate Advanced

Fitness Goal Loose Weight Gain Strength and Muscle I am Not Sure Yet

Preferred Personal Trainer's Gender Female Male

Cancel **Update**

ScreenShot 16 – Edit User

StarFit

Hello eff88!

The date today is: Tuesday, 17-Nov-2015

Content Management

Sign out

Website Users Management

Username	Email	Age	Gender	Location	Actions
ioannis	ioannis@gmail.com	35	male	West London	Edit Delete
theano	theano@gmail.com	34	female	600	Edit Delete
john	john@gmail.com	35	female	210	Edit Delete
loula	loula@gmail.com	23	female	231	Edit Delete
tika	tika@gmail.com	34	female	112	Edit Delete
rita	rita@gmail.com	34	female	120	Edit Delete
babas	babas@gmail.com	62	male	200	Edit Delete
fostl	fostl@gmail.com	62	female	190	Edit Delete
giannis	giannis@gmail.com	35	male	200	Edit Delete
elef	elef@gmail.com	34	female	125	Edit Delete
vangel	vangel@gmail.com	23	female	300	Edit Delete
roula	roula@gmail.com	34	female	130	Edit Delete
rma	rma@gmail.com	34	female	133	Edit Delete

Create New User

ScreenShot 17– Delete a User

3.4.6 Web Application's Security

Security plays a fundamental role for the reputation of a web application. Web application security is concerned with taking the appropriate measures for ensuring privacy of data of the Web application as well as preventing attacks made on the Web applications by malicious users (OWASP, 2015). According to OWASP, the number of web application attacks is constantly increasing (2013). Therefore, it is the responsibility of every developer and organisation to ensure that they employ the appropriate security methods and techniques in their disposal in order to protect their sensitive data. OWASP has identified the most common and serious risks that undermine a web application with SQL Injection, broken authentication and session management and cross-site scripting to be at the top three on the list (OWASP, 2013).

3.4.6.1 SQL injection

SQL injection refers to the process of performing SQL queries and commands in the input field of a form(OWASP, 2013; Zalewski, 2012). According to OWASP, the most effective precaution against SQL Injection is to ensure that the untrusted data are separated from commands and queries in the code(OWASP, 2013; Zalewski, 2012). This can be achieved by employing various techniques including the use of parameterized APIs, the use of *MySQL prepared statements*, the use of appropriate syntax for the escape of special characters and the implementation of proper validation on user input (OWASP, 2013).

The techniques that are going to be employed for the prevention of SQL Injection in StarFit Web application include escaping special characters and validating user input both on client and server-side.

3.4.6.2 Cross-site Scripting

Cross-site Scripting (XXS) is a Web application attack where attackers send malicious code into the Website (Duckett, 2014; OWASP, 2013). In XXS attacks the malicious scripts are executed on the client-side, that is, the user's web browser rather than on the server-side (DuPaul, 2015). An XXS flaw (or web application weakness) is found in Web applications where user untrusted data are dynamically included in web pages without validating or escaping special characters (OWASP, 2013; DuPaul, 2015). Untrusted data refer to the data coming from the users, which the web developers do not have control over, including comments and profiles created by users, files and images uploaded by users or third-party sites such as Facebook (Duckett, 2014). Although, cross-site-scripting is one of the most widespread among web applications flaws, it is easy to detect and prevent (OWASP, 2013). According to OWASP, user input validation and ensuring that untrusted data are separated from or escaped before inserted into the web pages(i.e. HTML documents) are among the most effective ways to prevent XXS (OWASP, 2013). Consequently, in order to protect StarFit web application from a potential XXS attack, user input validation and methods for escaping the data coming from the server and database were taken into consideration when developing the web application.

One of the core features of StarFit is allowing users to enter and submit data through online forms (e.g. registration and login forms). This feature may pose security risks such as XXS and SQL injection to the web application since untrusted data are sent to the web application by the users. Consequently, it becomes a necessity to employ certain methods and techniques in the code in order to prevent StarFit web application from being compromised by hackers. The methods and techniques that were implemented during the development of the fitness web application are described in detail below.

Applying techniques in order to escape special characters in strings coming from user input is also necessary for the protection of the StarFit web application from SQL injection and XXS attacks (OWASP, 2013; Duckett, 2014). Particularly, any data that come from untrusted source, that is, from users or third party sites must be escaped (The PHP Group, 2016; Duckett, 2014). PHP and MySQL API provides the helper function *mysqli_real_escape_string()* that escapes special characters by using a forward slash before those character.

Client-side methods for escaping special characters are also necessary in addition to the server-side escaping function above (Duckett, 2014). Therefore, the *textContent* property in JavaScript and *.text()* method in jQuery are used instead of *innerHTML* and *.html()* in order to ensure that user data are appended in the form of text instead of code that can be malicious (Duckett, 2014). Furthermore, the content in the StarFit web application is inserted by the website administrator into the database and then dynamically generated into the web pages from the database. Therefore, *htmlspecialchars()* PHP function is used in order to convert special characters to ASCII (as in the table below) to store them into the database and then convert them back with the *htmlspecialchars_decode()* function in order to be displayed properly on the web pages (The PHP Group, 2016; Gilmore, 2010). In this case characters are processed as characters instead of code (Duckett, 2014, 8). In the fitness application, **admin.php** does the conversion from special characters to ASCII (appendix 8, 26) whereas **profile.php** does the conversion from ASCII to special characters in order to be properly presented to the web page (appendix 9). Therefore, some of the conversions include (OWASP, 2015):

```
& --> &amp;
< --> &lt;
> --> &gt;
" --> &quot;
' --> &#x27;
/ --> &#x2F;
```

In general, inserting user data in the web pages without being escaped should be avoided. Examples of user data placed in HTML document include within HTML tags (e.g. *<style>untrusted data</script>*), in attribute names (e.g. *<div untrusted data>*), inside comments (e.g. *<!—untrusted data-->*), in tag names (e.g. *<untrusted data />*) or inside dynamically generated JavaScript (e.g. *<script>alert('untrusted data') or <div onclick="untrusted data">*)

(Duckett, 2014; OWASP, 2015). Taking into consideration the above recommendations, as far as the StarFit web application is concerned, special characters in the data that user provides are escaped with a server-side function `mysqli_real_escape_string()` and the data are dynamically appended to the web pages if necessary with the client-side method `.text()` or `textContent` property. Additionally, the special characters included in the content (e.g. articles, workout and exercise plans) inserted by the website administrator into the database will be converted to HTML entities with the `htmlspecialchars()` PHP function and then converted back with the `htmlspecialchars_decode()` function in order to be displayed properly on the web pages (The PHP Group, 2016; Gilmore, 2010).

3.4.6.3 User Input Validation

Validation is a necessary feature for any web application that receives external input from users, through online forms for instance, since it both ensures that users submit valid information and prevents any malicious code from being inserted in the web application (Jovanovic, 2009). Input data validation can be achieved on the server and client (browser) (Jovanovic, 2009). In the case of StarFit application, users' input will be validated both on the server with PHP and on the client with JavaScript. Both client-side and server-side are necessary for the security and protection of the web application from attacks such as XSS and SQL injection. This is because, client-side validation is implemented with JavaScript which means that the validation will only work if the JavaScript on the user's web browser is turned on. Therefore, the fact that validation on the server-side is implemented ensures that user input will be properly validated (Jovanovic, 2009; Ducket, 2014). Although client-side validation may cause security risks, it is more immediate and responsive to the users since they can receive feedback without the page being reloaded because with the use of Ajax user input is validated as the user types without the need to submit the form (Jovanovic, 2009).

In order to register, users need to complete all input fields of the registration form. The input fields will include username, email, password, age, gender, height, weight, fitness aim and current fitness level. Validation will be implemented both on the server via PHP and on the client via JavaScript and jQuery along with AJAX techniques. Regular expressions are used in order to validate the username, email and password provided by the user.

Username Validation

A regular expression is used during both server-side and client-side validation in order to ensure that the username is in proper form and prevent users from submitting any dangerous characters such as HTML tags or other special characters (Robin, 2015). Therefore following the regular expression in the `register.php`, the string pattern that the username needs to match contains only letters and numbers. As a result, in case the user enters special characters or white spaces, the validation will not pass. If the data does not meet the condition requirements (*if..*), then the validation fails and the function `exit()` is used to terminate the script and send the response message specified in the parentheses to the client (appendix 10). The `error-handling.js` file includes the JavaScript code using jQuery library and AJAX techniques in order to

perform the client-side validation (Robin, 2015). The validation for the format of the username is performed when the user enters a value in the input field. The format of the username is checked against a regular expression and must contain only letters and numbers (appendix 11).

Email Validation

There are cases where users make spelling errors or provide an invalid email address. Therefore, PHP provides the `filter_var()` function that applies filtering to check the validity of the email against the RFC 822 syntax (The PHP Group, 2016). Therefore, in order to check the validity of the email provided by the user in the registration form, `filter_var()` along with the `FILTER_VALIDATE_EMAIL` filter is used on the server-side (appendix 12), whereas a regular expression is used on the client-side (appendix 13).

Password Validation

Server-side – register.php

Similar to the username, the password is checked against a specific pattern in the regular expression both on the client and server-side (appendix 14-15).

Numeric Values Validation

Since height, weight, age and waist input fields are always required to have a numeric value, the HTML5 attribute value `number` is used as for example (W3C, 2014):

```
<input type="number" class="form-control" id="userAge" name="age" placeholder="Age">
```

The `type="number"` is not supported in earlier versions of Internet Explorer 10 (Can I Use, 2015). Therefore, a function is created (using the `$.each` function of jQuery) that loops through the particular fields (based on their id) and checks if their values are numeric when the user enters a value (Duckett, 2014; JQuery, 2016) (appendix 16).

Required fields

In order for the StarFit web application to deliver content that is customised to the user preferences, all fields in the forms of the StarFit web application require input by the user, that is, the user must complete all form fields before submitting the form. HTML5 provides the `required` attribute that can be placed in the input fields (W3C, 2014):

```
<input type="text" class="form-control" id="userName" name="username" placeholder="Username" required>
```

Source: reg-form.php

When the required attribute is set, the user is required to enter a value before submitting the form otherwise an error message will appear (W3S).

Similar to the `type="number"`, the required attribute is not supported on earlier versions of Internet Explorer 10 (Can I Use, 2015). Therefore a function that checks whether the fields are empty or not is created both on the client-side in jQuery with the and server-side with the `isset()` PHP function (appendix 17).

3.4.6.4 Username and Email Authentication

In order to ensure that the username and user email address are always unique and accurately checked the registration and login process correctly the data will be converted to lowercase with **strtolower()** PHP function before stored in the database (The PHP Group, 2016). This function is useful in the user authentication process during the login since it check if the username entered in the login form matches the one that the user used to register with (appendix 18).

3.4.6.5 Password Security

The world of Internet is full of malicious attackers that seek for opportunities to hack users' passwords and access personal information (Jovanovic, 2009). Encryption is a method used for protecting users' data and privacy from malicious attacks. The purpose of encryption is to transform data values, passwords in our case, into a format that cannot be recognised or translated into its original format (*hashing*). The encryption function that will be used for users' passwords of the fitness application is the md5() hash function (The PHP Group, 2016). The md5() function creates a new hash string using the MD5 algorithm in order to make passwords unreadable as in the example below and therefore not being able to be revealed by hackers (appendix 19).

3.5 Testing Phase

The purpose of this phase is to test whether the system that has been developed meets the user and technical requirements defined in the analysis and implementation phases. In this section the main functionalities of the system will be tested considering use case scenarios that are demonstrated with screenshots of the pages and database tables that reflect the differences in the change of information.

Use Case Scenario 1 - User Registration

User Goal: Become member of the application

Actors: Non-Registered user

In this scenario the new user attempts to register with a username and email that already exists in the database as well as an invalid password, therefore, error messages appear and the user cannot register.

Screenshot of the phpMyAdmin interface showing the 'Users' table from the 'fitnessapp_db' database.

Table Structure:

```
SELECT * FROM `users` ORDER BY `usr_id` ASC
```

Table Headers:

- Sort by key: PRIMARY (Ascending)
- usr_id
- username
- email
- password
- location
- age
- gender
- height
- weight
- tr_gender

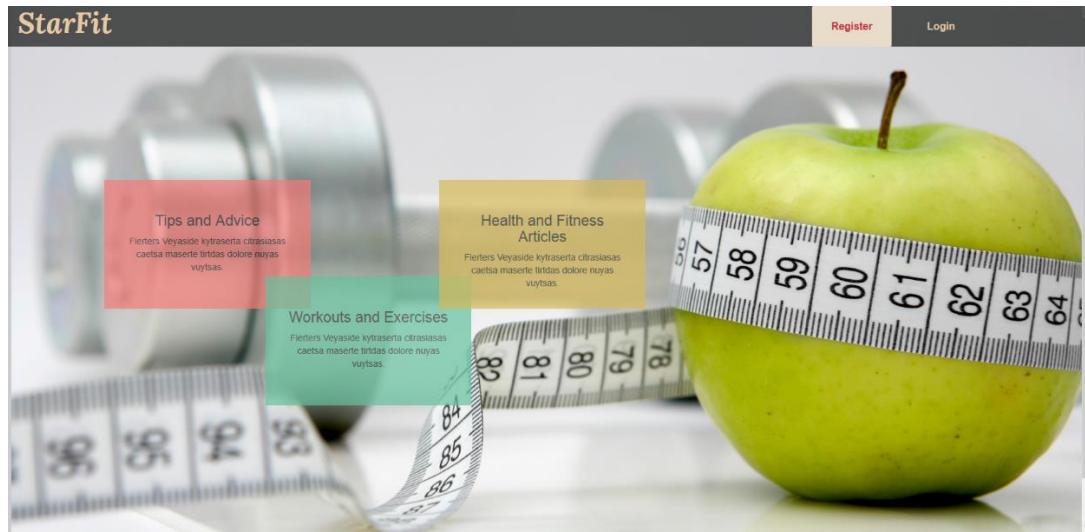
Data Rows (15 rows total):

usr_id	username	email	password	location	age	gender	height	weight	tr_gender
1	ioannis	ioannis@gmail.com	805b90113a9bb23cb62e092adda8c19f	West London	35	male	170	200	male
84	theano	theano@gmail.com	089c439f2e33ecdba483b197df9a91b8	Angel	34	female	67	600	female
85	john	john@gmail.com	6e0b7076126a29d5dcba483b5435387b7b	Westminster	35	female	73	210	female
100	loula	loula@gmail.com	b07c9ffeeb89d9e0d2292a3550f8e5ed	Angel	23	female	231	231	female
101	tika	tika@gmail.com	089c439f2e33ecdba483b197df9a91b8	Guildford	34	female	67	112	female
105	rita	rita@gmail.com	c592fd7e918169cf04ddccbb700865c9	Canary Wharf	34	female	56	120	male
106	babas	babas@gmail.com	c81b4c7370cafca80bed226ff025dd57	Holloway Road	62	male	70	200	male
111	fostl	fostl@gmail.com	ca80a7bc2851ba7d8080a3b91cd14fa8	London Bridge	62	female	69	190	female
112	giannis	giannis@gmail.com	482cc1fba7dc4a8183b4e8474ff86466	West London	35	male	80	200	male
113	elef	elef@gmail.com	cde3af6d040a1e2730cf22ca5d590003	Peckton	34	female	68	125	male
114	vangel	vangel@gmail.com	fd86cd6f966494f03e45cf3156cf7c0d	Angel	23	female	67	300	female
115	roula	roula@gmail.com	980f1d7f4db17c652eeb00b266eca17	Kesington	34	female	56	130	female

Action Buttons:

- Check all
- With selected: Edit, Copy, Delete
- Export

Caption: Users Table



Register

Username
john

Email address
Email

Password
Password

Place of Residence
Place of Residence

Next

Username already exists

Register

Username
john88

Email address
john@gmail.com

Password
Password

Place of Residence
Place of Residence

Next

Email already exists

Register

Username
john88

Email address
john88@gmail.com

Password

Place of Residence
Place of Residence

Next

Password must be at least 6 characters and should contain at least one letter and one number

By entering different information in the form, the messages disappear and the user moves to the next step. It is worth mentioning that the user can go to next step but cannot register due to the server-side validation as well.

Register

Username
john88

Email address
john88@gmail.com

Password

Place of Residence
Elephant&Castle

Next

Age
35

Gender Female Male

Height
67

Weight
156

Go Back **Next**

Fitness Level Beginner Intermediate Advanced

Fitness Goal Loose Weight Gain Strength and Muscle I am Not Sure Yet

Preferred Personal Trainer's Gender Female Male

Create Profile

The new user is inserted in both the *users* and *user_bodytype* tables (at the very last row) with the same *usr_id*. The user is now redirected to the homepage with his name appearing in the header of the page.

Screenshot of the MySQL Workbench interface showing the 'Users' table.

Schema Tree:

- user_score
- workout_plans
- information_schema
- mysql
- performance_schema
- phpmyadmin
- test

Users Table:

	usr_id	username	email	password	location	age	gender	height	weight	tr_gender
<input type="checkbox"/>	1	ioannis	ioannis@gmail.com	805b90113a9b23cb62e092adda8c19f	West London	35	male	170	200	male
<input type="checkbox"/>	84	theano	theano@gmail.com	089c4392e33ecdba483b197df9a91b8	Angel	34	female	67	600	female
<input type="checkbox"/>	85	john	john@gmail.com	6e0b7076126a29d5dfcbd54835387b7b	Westminster	35	female	73	210	female
<input type="checkbox"/>	100	loula	loula@gmail.com	b07c9feeb89d9e0d2292a3550f8e5ed	Angel	23	female	231	231	female
<input type="checkbox"/>	101	tika	tika@gmail.com	089c4392e33ecdba483b197df9a91b8	Guildford	34	female	67	112	female
<input type="checkbox"/>	105	rita	rita@gmail.com	c592fd7e91816f9cf04ddcbb700865c9	Canary Wharf	34	female	56	120	male
<input type="checkbox"/>	106	babas	babas@gmail.com	c81b4c7370cafca80bad226f025dd57	Holloway Road	62	male	70	200	male
<input type="checkbox"/>	111	fostl	fostl@gmail.com	c880a7bc2851ba7d8080a3b91cd14fa8	London Bridge	62	female	69	190	female
<input type="checkbox"/>	112	giannis	giannis@gmail.com	482cc1fba7dc4a8183b4e8474ff86466	West London	35	male	80	200	male
<input type="checkbox"/>	113	elef	elef@gmail.com	cde3af6d040a1e2730cf22ca5d590003	Peckton	34	female	68	125	male
<input type="checkbox"/>	114	vangel	vangel@gmail.com	fd86cd6966494f03e45cf3156cf7c0d	Angel	23	female	67	300	female
<input checked="" type="checkbox"/>	115	roula	roula@gmail.com	980ff1d7f4db17c6528eeb00b266eca17	Kesington	34	female	56	130	female
<input type="checkbox"/>	133	john88	john88@gmail.com	6e0b7076126a29d5dfcbd54835387b7b	Elephant&Castle	35	female	67	156	female

Buttons at the bottom: Up, Check all, With selected: Edit, Copy, Delete, Export.

Users Table

Screenshot of the MySQL Workbench interface showing the 'User_bodytype' table.

Schema Tree:

- users
- user_bodytype
- user_details
- user_score
- workout_plans
- information_schema
- mysql
- performance_schema
- phpmyadmin
- test

User_bodytype Table:

	fit_id	bodyfat	bmi	Ibm	level	type	aim	usr_id
<input type="checkbox"/>	1	0	16.4766	150	beginner		weight-loss	1
<input type="checkbox"/>	49	113.566	93.963	127	intermediate	obese	weight-loss	84
<input type="checkbox"/>	50	25.0938	27.7031	-5059.69	advanced	obese	weight-loss	85
<input type="checkbox"/>	65	26.5419	3.04329	-5900.19	beginner	over-weight	strength-muscle	100
<input type="checkbox"/>	66	21.8577	17.5398	-2912.59	intermediate	normal-weight	weight-loss	101
<input type="checkbox"/>	70	34.7006	26.9005	-4044.07	beginner	obese	weight-loss	105
<input type="checkbox"/>	71	32.4927	28.6939	-6298.53	intermediate	obese	strength-muscle	106
<input type="checkbox"/>	76	33.556	28.055	-6185.65	advanced	obese	weight-loss	111
<input type="checkbox"/>	77	18.2125	21.9688	-3442.5	intermediate	over-weight	strength-muscle	112
<input type="checkbox"/>	78	23.8449	19.0041	-2855.62	beginner	normal-weight	weight-loss	113
<input type="checkbox"/>	79	56.2678	46.9815	-7295.04	beginner	obese	strength-muscle	114
<input checked="" type="checkbox"/>	80	37.3907	29.1422	-4730.79	intermediate	obese	weight-loss	115
<input type="checkbox"/>	98	31.9665	24.4304	-4830.77	intermediate	obese	weight-loss	133

Buttons at the bottom: Up, Check all, With selected: Edit, Copy, Delete, Export.

User_bodytype Table

Since the user indicated he has an intermediate fitness level, a six weeks plan appears based on the algorithm implemented for user categorization taking into consideration the user's gender, fitness level and fitness goal (appendix 9). As a result, by looking at the title of the workout plan, it is proved that the plan chosen from the *workout_plans* table is based on the user's gender, fitness level and fitness goal as illustrated below.

Use Case Scenario 2 – User Submits Progress

User Goal: Submit Progress

Actors: Registered user

User can submit his progress by ticking on the checkbox that corresponds to each week. As an example, the case where the user has completed the first two weeks and clicks on the '*Save Progress*' to submit his progress will be demonstrated below.

Articles		Workout Exercises		Your Personalised Plan		Your Body Measurements	
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Complete
Wk 1 Total Body Toning Routines – 2x a week 1 Reps: 12 -15 per move Sets: 1 set during week 1, 2 sets during weeks 2 and 3 Moves: Plank with Alternating Leg Lift Wood Chop with Resistance Band Dumbbell Squat and Overhead Press Romanian Deadlift Bent-Over Row Dynamic Lunge	Results-Enhancing Recovery – 2x a week Do the following three moves in the order shown. Repeat two or three times. Moves: Hip Flexor Stretch Double Hip Extension Standing Chest Stretch Floor I-Position Raise	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 20 seconds per move, 5 intervals Week 2: 30 seconds per move, 6 intervals Week 3: 40 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	Results-Enhancing Recovery – 2x a week Do the following three moves in the order shown. Repeat two or three times. Moves: Hip Flexor Stretch Double Hip Extension Standing Chest Stretch Floor I-Position Raise	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 20 seconds per move, 5 intervals Week 2: 30 seconds per move, 6 intervals Week 3: 40 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	Total Body Toning Routines – 2x a week Reps: 12 -15 per move Sets: 1 set during week 1, 2 sets during weeks 2 and 3 Moves: Plank with Alternating Leg Lift Wood Chop with Resistance Band Dumbbell Squat and Overhead Press Romanian Deadlift Bent-Over Row Dynamic Lunge	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 20 seconds per move, 5 intervals Week 2: 30 seconds per move, 6 intervals Week 3: 40 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	
Wk 2 Total Body Toning Routines – 2x a week 1 Reps: 12 -15 per move Sets: 1 set during week 1, 2 sets during weeks 2 and 3 Moves: Plank with Alternating Leg Lift Wood Chop with Resistance Band Dumbbell Squat and Overhead Press Romanian Deadlift Bent-Over Row Dynamic Lunge	Results-Enhancing Recovery – 2x a week Do the following three moves in the order shown. Repeat two or three times. Moves: Hip Flexor Stretch Double Hip Extension Standing Chest Stretch Floor I-Position Raise	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 20 seconds per move, 5 intervals Week 2: 30 seconds per move, 6 intervals Week 3: 40 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	Results-Enhancing Recovery – 2x a week Do the following three moves in the order shown. Repeat two or three times. Moves: Hip Flexor Stretch Double Hip Extension Standing Chest Stretch Floor I-Position Raise	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 20 seconds per move, 5 intervals Week 2: 30 seconds per move, 6 intervals Week 3: 40 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	Total Body Toning Routines – 2x a week Reps: 12 -15 per move Sets: 1 set during week 1, 2 sets during weeks 2 and 3 Moves: Plank with Alternating Leg Lift Wood Chop with Resistance Band Dumbbell Squat and Overhead Press Romanian Deadlift Bent-Over Row Dynamic Lunge	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 20 seconds per move, 5 intervals Week 2: 30 seconds per move, 6 intervals Week 3: 40 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	
Wk 3 Total Body Toning Routines – 2x a week 3 Reps: 12 -15 per move Sets: 1 set during week 1, 2 sets during weeks 2 and 3 Moves: Plank with Alternating Leg Lift Wood Chop with Resistance Band Dumbbell Squat and Overhead Press Romanian Deadlift Bent-Over Row Dynamic Lunge	Results-Enhancing Recovery – 2x a week Do the following three moves in the order shown. Repeat two or three times. Moves: Hip Flexor Stretch Double Hip Extension Standing Chest Stretch Floor I-Position Raise	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 1 second per move, 5 intervals Week 2: 2 seconds per move, 6 intervals Week 3: 3 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	Results-Enhancing Recovery – 2x a week Do the following three moves in the order shown. Repeat two or three times. Moves: Hip Flexor Stretch Double Hip Extension Standing Chest Stretch Floor I-Position Raise	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 1 second per move, 5 intervals Week 2: 2 seconds per move, 6 intervals Week 3: 3 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	Total Body Toning Routines – 2x a week Reps: 12 -15 per move Sets: 1 set during week 1, 2 sets during weeks 2 and 3 Moves: Plank with Alternating Leg Lift Wood Chop with Resistance Band Dumbbell Squat and Overhead Press Romanian Deadlift Bent-Over Row Dynamic Lunge	Fat-Blasting Intervals – 2x a week Do the following three moves back to back with no rest in between. That's 1 Interval. Rest for one to two minutes between intervals Complete as many reps of each move as you can in the prescribed amount of time. Week 1: 1 second per move, 5 intervals Week 2: 2 seconds per move, 6 intervals Week 3: 3 seconds per move, 7 intervals Moves: Mountain Climber Lateral Shuffle Jump Squat	

The changes are then reflected in the `user_score` table under the score and level columns as illustrated below:

The screenshot shows the phpMyAdmin interface for a MySQL database. On the left, a tree view lists various tables: articles, categories, exercises, users, user_bodytype, user_details, user_score, workout_plans, information_schema, mysql, performance_schema, phpmyadmin, and test. The 'user_score' table is selected. The main area displays the 'user_score' table with the following data:

	+ Options	← T →	id	score	level	user_id
<input type="checkbox"/>	Edit Copy Delete		4	2	intermediate	133

Below the table, there are navigation buttons: 'Check all', 'With selected:', 'Edit', 'Copy', 'Delete', and 'Export'. At the bottom, there are links for 'Print view', 'Export', 'Display chart', and 'Create view'.

User_score Table

In case the user completes all of the weeks of the workout plan (six weeks in this case), the information in the *user_score* table will be updated and the user will automatically be upgraded to the next fitness level which is *advanced*. Since the *level* column exists in both *user_score* and *user_bodytype* tables, the changes will be reflected in the *user_bodytype* table as well.

User_score Table

	<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	<input type="checkbox"/> id	<input type="checkbox"/> score	<input type="checkbox"/> level	<input type="checkbox"/> user_id
					4	6	advanced	133

User_bodytype Table

	<input type="checkbox"/>	<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	<input type="checkbox"/> fit_id	<input type="checkbox"/> bodyfat	<input type="checkbox"/> bmi	<input type="checkbox"/> lbm	<input type="checkbox"/> level	<input type="checkbox"/> type	<input type="checkbox"/> aim	<input type="checkbox"/> usr_id
					1	0	16.4766	150	beginner		weight-loss	1
					49	113.566	93.963	127	intermediate	obese	weight-loss	84
					50	25.0938	27.7031	-5059.69	advanced	obese	weight-loss	85
					65	26.5419	3.04329	-5900.19	beginner	over-weight	strength-muscle	100
					66	21.8577	17.5398	-2912.59	intermediate	normal-weight	weight-loss	101
					70	34.7006	26.9005	-4044.07	beginner	obese	weight-loss	105
					71	32.4927	28.6939	-6298.53	intermediate	obese	strength-muscle	106
					76	33.556	28.055	-6185.65	advanced	obese	weight-loss	111
					77	18.2125	21.9688	-3442.5	intermediate	over-weight	strength-muscle	112
					78	23.8449	19.0041	-2855.62	beginner	normal-weight	weight-loss	113
					79	56.2678	46.9815	-7295.04	beginner	obese	strength-muscle	114
					80	37.3907	29.1422	-4730.79	intermediate	obese	weight-loss	115
					98	31.9665	24.4304	-4830.77	advanced	obese	weight-loss	133

Since the user's level has been upgraded, the user will be provided with a different workout plan in the homepage, one for advanced users.

Advanced Plan for Weight Loss				Workout Exercises		Your Personalised Plan		Your Body Measurements	
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7			Complete
Wa 1 Warm-up Squats - 2 sets warm up (prearming to weight); 3-4 work sets 5-8 reps - try to increase weights. Leg Press - 3x10-12 reps Stiff-legged Deadlift - 2x10 reps Leg Extensions (1 or 2 sets - but by now your legs might be finished!), Seated Calf Raises (x10-12 reps).	Wk (60 minutes fasted)	Shoulders, Triceps. Als Use the ab workout as your warm-up - take as little rest between sets as possible. Hanging Leg Raises - 3 sets to failure. Rope Pulls - 2 sets. Barbell Military Press - 2 warm-up sets, 3rd reps. Upright Rows - 3x12 reps. Lateral Raises - 2x12 reps. French Presses - 3x10 reps. Triceps Pushdowns - 2x10 reps. Reverse Triangles Pushdowns - 2x8-10 reps.	Back Lat. Pulldowns - 2 warm up sets, 3-4 sets at 6-10 reps, increasing weight. Cable Rows - 3x10 reps. One armed Dumbbell Rows - 2x8 reps. Hyperextensions - 2x20 reps. Dumbbell Shrugs (2x10 reps or to failure).	Cards - Interval training or at increased heart rate (60-90%) 30-45 minutes	Chest, Biceps Warming Flat Bench Press - 2 warm up sets, 3x8 reps. Hammer Indie Press - 2x8 reps, increasing weight. Incline Dumbbell Press - 3x6-10 reps. Dumbbell Pullvers - 3x12 reps. Barbell Biceps Curls - 2 warm up sets, 3x10 reps. Incline Dumbbell Curls - 2-3 sets 6-8 reps, increasing weight. Concentration Curls - 1 set to failure.				
Wk 2 Warm-up Squats - 2 sets warm up (prearming to weight); 3-4 work sets 5-8 reps - try to increase weights. Leg Press - 3x10-12 reps Stiff-legged Deadlift - 2x10 reps Leg Extensions (1 or 2 sets - but by now your legs might be finished!), Seated Calf Raises (x10-12 reps).	Wk (60 minutes fasted)	Shoulders, Triceps. Als Use the ab workout as your warm-up - take as little rest between sets as possible. Hanging Leg Raises - 3 sets to failure. Rope Pulls - 2 sets. Barbell Military Press - 2 warm-up sets, 3rd reps. Upright Rows - 3x12 reps. Lateral Raises - 2x12 reps. French Presses - 3x10 reps. Triceps Pushdowns - 2x10 reps. Reverse Triangles Pushdowns - 2x8-10 reps.	Back Lat. Pulldowns - 2 warm up sets, 3-4 sets at 6-10 reps, increasing weight. Cable Rows - 3x10 reps. One armed Dumbbell Rows - 2x8 reps. Hyperextensions - 2x20 reps. Dumbbell Shrugs (2x10 reps or to failure).	Cards - Interval training or at increased heart rate (60-90%) 30-45 minutes	Chest, Biceps Warming Flat Bench Press - 2 warm up sets, 3x8 reps. Hammer Indie Press - 2x8 reps, increasing weight. Incline Dumbbell Press - 3x6-10 reps. Dumbbell Pullvers - 3x12 reps. Barbell Biceps Curls - 2 warm up sets, 3x10 reps. Incline Dumbbell Curls - 2-3 sets 6-8 reps, increasing weight. Concentration Curls - 1 set to failure.				
Wk 3 Warm-up Squats - 2 sets warm up (prearming to weight); 3-4 work sets 5-8 reps - try to increase weights. Leg Press - 3x10-12 reps Stiff-legged Deadlift - 2x10 reps Leg Extensions (1 or 2 sets - but by now your legs might be finished!), Seated Calf Raises (x10-12 reps).	Wk (60 minutes fasted)	Shoulders, Triceps. Als Use the ab workout as your warm-up - take as little rest between sets as possible. Hanging Leg Raises - 3 sets to failure. Rope Pulls - 2 sets. Barbell Military Press - 2 warm-up sets, 3rd reps. Upright Rows - 3x12 reps. Lateral Raises - 2x12 reps. French Presses - 3x10 reps. Triceps Pushdowns - 2x10 reps. Reverse Triangles Pushdowns - 2x8-10 reps.	Back Lat. Pulldowns - 2 warm up sets, 3-4 sets at 6-10 reps, increasing weight. Cable Rows - 3x10 reps. One armed Dumbbell Rows - 2x8 reps. Hyperextensions - 2x20 reps. Dumbbell Shrugs (2x10 reps or to failure).	Cards - Interval training or at increased heart rate (60-90%) 30-45 minutes	Chest, Biceps Warming Flat Bench Press - 2 warm up sets, 3x8 reps. Hammer Indie Press - 2x8 reps, increasing weight. Incline Dumbbell Press - 3x6-10 reps. Dumbbell Pullvers - 3x12 reps. Barbell Biceps Curls - 2 warm up sets, 3x10 reps. Incline Dumbbell Curls - 2-3 sets 6-8 reps, increasing weight. Concentration Curls - 1 set to failure.				
Wk 4 Warm-up Squats - 2 sets warm up (prearming to weight); 3-4 work sets 5-8 reps - try to increase weights. Leg Press - 3x10-12 reps Stiff-legged Deadlift - 2x10 reps Leg Extensions (1 or 2 sets - but by now your legs might be finished!), Seated Calf Raises (x10-12 reps).	Wk (60 minutes fasted)	Shoulders, Triceps. Als Use the ab workout as your warm-up - take as little rest between sets as possible. Hanging Leg Raises - 3 sets to failure. Rope Pulls - 2 sets. Barbell Military Press - 2 warm-up sets, 3rd reps. Upright Rows - 3x12 reps. Lateral Raises - 2x12 reps. French Presses - 3x10 reps. Triceps Pushdowns - 2x10 reps. Reverse Triangles Pushdowns - 2x8-10 reps.	Back Lat. Pulldowns - 2 warm up sets, 3-4 sets at 6-10 reps, increasing weight. Cable Rows - 3x10 reps. One armed Dumbbell Rows - 2x8 reps. Hyperextensions - 2x20 reps. Dumbbell Shrugs (2x10 reps or to failure).	Cards - Interval training or at increased heart rate (60-90%) 30-45 minutes	Chest, Biceps Warming Flat Bench Press - 2 warm up sets, 3x8 reps. Hammer Indie Press - 2x8 reps, increasing weight. Incline Dumbbell Press - 3x6-10 reps. Dumbbell Pullvers - 3x12 reps. Barbell Biceps Curls - 2 warm up sets, 3x10 reps. Incline Dumbbell Curls - 2-3 sets 6-8 reps, increasing weight. Concentration Curls - 1 set to failure.				

Comparing the title of the plan with the one in the *workout_plans* table proves that the information has been correctly updated.

<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	25	1,2,3,4,5,6	male	weight-loss	intermediate	DEISEL IN DAYS	INCLINE PRESS/ALT	DB OR EZ BAR CURL - 6-8 Reps	REST	ARNOLD PRESS OR	SQUATS - 10-12 Reps	F <input type="checkbox"/> Show current browsing query	
	plan_id	plan_weeks	plan_gender	plan_category	plan_level	plan_title	plan_day_one	plan_day_two	plan_day_three	plan_day_four	plan_day_five	plan_day_six	plan_day_seven	.../ Forward queries on Enter and incar...	
<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	26	1,2,3,4	male	weight-loss	advanced	5 Day A Week Big Gain Workout	Flat Bench Dumbbell Press - 8-12 Reps Inc...	Lat Pulldowns - 12-15 Reps	Standing Dumbbell Press - 8-10 Reps Latera...	Rest	Bicep Barbell Curls - 8-10 Reps Preacher ...	Calf Raises - 15-20 Reps	Leg Curls - 15...
<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	27	1,2,3,4,5,6,7,8,9,10,11,12	male	strength-muscle	beginner	Power & Muscle!	Incline Bench Press - 6 x 6 Reps	Leg Press - 6 x 6 Reps	Squats - 6 x 6 Reps	Hack Squat - ...	Speed Bench Press - 8 x 3 (60% of heavy day) [Tue]...	Reverse Grip Barbell Row -	Medium Grip
<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	28	1,2,3,4,5,6,7,8,9,10,11,12	male	weight-loss	beginner	Randall Johnson's 5-Day Workout For Mass And Fat L...	Bench Press - 12, 10, 8 Reps Flat Bench Du...	Standing Barbell Curl - 12 Reps Standing ...	Lat Pull Downs - 12, 12, 12 Reps	Seated Rows... Reps Le...	Standing Calf Raise - 15,15,15 Reps	Shoulder Press - 12,10,8 Reps Side Lateral...	A.M. Cardio: Delta/Traps: /Forearms: Intensity C...
<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	29	1,2,3,4	female	strength-muscle	advanced	Best Female Bodybuilding Workout	A.M. Cardio, Chest/Triiceps Quads/Hamstrings /Calves:	A.M. Cardio, Abs: 35-45 minutes Low Intensity C...	A.M. Cardio, Back/Biceps /Forearms: 35-45 minutes Low Intensity C...	A.M. Cardio, Deltas/Traps: /Forearms: Intensity C...	35-45 minutes Low Intensity Cardio	A.M. Cardio: Delta/Traps: /Forearms: Intensity C...	35-45 minutes Low Intensity Cardio
<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	30	1,2,3,4	female	weight-loss	advanced	Advanced Plan for Weight Loss	Warm up - 2 sets warm up (pyramid to ...)	Walk (60 minutes, fasted)	Shoulders, Triceps, Abs	Use the ab workout as you...	Back	Cardio - Interval training or at increased heart r...	Chest, Biceps
<input type="checkbox"/> Edit	<input type="checkbox"/> Copy	<input type="checkbox"/> Delete	32	1,2,3,4,5,6	female	weight-loss	intermediate	Fit and Lean	Total-Body Toning Routines 4€ 2x a week Reps. 12...	Results-Enhancing Recovery 4€ 2x a week Do the f...	Fat-Blasting Intervals 4€ 2x a week Do the follo...	Results-Enhancing Recovery 4€ 2x a week Do the f...	Total-Body Toning Routines 4€ 2x a week Reps. 12...	Fat-Blasting Intervals 4€ 1 week Do the follo...	

Use Case Scenario 3 – User Edits Personal Details

User Goal: Edit submitted information

Actors: Registered user

There are cases where the users want to change some or all of the information specified during the registration process. In this case, the user chose the female radio button during the registration process by mistake as shown in the registration form and *users* table above. In order to change information on his profile, user can click on the '*Edit Profile*' link and attempt to change only his gender.

The screenshot shows a mobile application interface. On the left, a vertical sidebar displays a 'Progress' section and a 'Workout Plan for Weight Loss' for 'Day 1'. The plan includes exercises like 'Warm up Squats', 'Walk 10 minutes fasted', and 'Cardio 30 mins'. On the right, a modal window titled 'Edit Profile' is open, prompting for 'Username', 'Email address', and 'Password'. It also asks for 'Place of Residence', 'Age', 'Gender' (Female/Male), 'Weight', 'Height', 'Fitness Level' (Beginner/Intermediate/Advanced), 'Fitness Goal' (Loose Weight/Gain Strength and Muscle/I am Not Sure Yet), and 'Preferred Personal Trainer's Gender' (Female/Male). At the bottom of the modal are 'Cancel' and 'Edit Profile' buttons.

The screenshot shows the StarFit website. At the top, it says 'Welcome john88!' with 'Logout' and 'Edit Profile' options. Below the header, there are tabs for 'Articles', 'Workout Exercises', 'Your Personalised Plan', and 'Your Body Measurements'. A banner image features a woman running outdoors. The main content area is titled '5 Day A Week Big Gain Workout' (with the title circled in red). It lists a 5-day workout plan with exercises for each day, including 'Day 1', 'Day 2', 'Day 3', 'Day 4', 'Day 5', 'Day 6', and 'Day 7 Complete'. Each day includes a list of exercises like 'Flat Bench Dumbbell Press', 'Lat Pulldowns', 'Standing Dumbbell Press', etc., with specific rep counts and descriptions. The background of the page shows a sunset over a path through grass.

It has been noticed that the personalised workout plan has changed due to the change in the user's gender. However, because the user's level was changed previously to advanced, the amount of weeks remain the same since this plan is one of the four weeks plans for advanced users. Therefore, the gender has changed so as the workout plan:

User Details										
	user_id	username	email	password	location	age	gender	height	weight	tr_gender
Edit	1	ioannis	ioannis@gmail.com	805b90113a9bb23cb62e092adada8c19f	West London	35	male	170	200	male
Edit	84	theano	theano@gmail.com	089c439f2e33ecdba483b197df9a91b8	Angel	34	female	67	600	female
Edit	85	john	john@gmail.com	6e0b7076126a29d5dfcb5d4835387b7b	Westminster	35	female	73	210	female
Edit	100	loula	loula@gmail.com	b07c9ffee89d9e0d2292a3550f8e5ed	Angel	23	female	231	231	female
Edit	101	tika	tika@gmail.com	089c439f2e33ecdba483b197df9a91b8	Guildford	34	female	67	112	female
Edit	105	rita	rita@gmail.com	c592fd7e91816fcf04ddccbf00865c9	Canary Wharf	34	female	56	120	male
Edit	106	babas	babas@gmail.com	c81b4c7370fcacfa80bad226f025dd57	Holloway Road	62	male	70	200	male
Edit	111	festi	festi@gmail.com	ca80a7bc2051ba7d8080a3b91cd14fa8	London Bridge	62	female	69	190	female
Edit	112	giannis	giannis@gmail.com	482cc1fb7dc4a8183b4e847ff86466	West London	35	male	80	200	male
Edit	113	elef	elef@gmail.com	cde3af6d040a1e2730cf22ca5d590003	Peckton	34	female	68	125	male
Edit	114	vangel	vangel@gmail.com	fd86cd6f966494f03e45cf3156cf7c0d	Angel	23	female	67	300	female
Edit	115	roula	roula@gmail.com	980f1d74fb17c6528eb00b266eca17	Kesington	34	female	56	130	female
Edit	133	john88	john88@gmail.com	6e0b7076126a29d5dfcb5d4835387b7b	Elephant & Castle	35	male	67	156	female

Users Table

Workout_plans Table

Use Case Scenario 4 – View User Reports

User Goal: View statistics about registered users' information

Actors: Website administrator

One of the most important purposes of the content management system is to provide the website administrator with the ability to view statistics on certain information about the registered users of the website. Particularly, website administrators who can also be managers want to view specific information about what type of users and from where show interest in StarFit's fitness services. In this way they will be able to evaluate the results and make important decisions about future improvements in facilities and services of the business and StarFit web application. Initially the website administrator logs in to the CMS and clicks on the

'User Reports' link. In the admin_users table there are currently two administration users as shown below.

	adm_id	adm_username	adm_fname	adm_lname	adm_email	adm_psw	adm_age	adm_gender	adm_spec	adm_prof
<input type="checkbox"/>	1	efi88	efi	iliadi	efi@gmail.com	089c4392e33ecdba483b197df9a91b8	27	female	Strength	Trainer
<input type="checkbox"/>	11	john	john	papas	john@gmail.com	6e0b7076126a29d5dfcbd54835387b7b	30	female	manager	Manager

Admin_Users Table

The date today is: Monday 18-01-2016

StarFit

Hello efi88!

The date today is: Monday 18-01-2016

Admin Users Management

Content Management

Website Users Management

User Reports

Create New User

Username	Email	Age	Gender	Weight	Height	Bodyfat	BMI	Fitness Goal	Fit Level	Preferred PT Gender	Location	Actions
ioannis	ioannis@gmail.com	35	male	200	170	0	16.4766	weight-loss	beginner	male	London	<button>Edit</button> <button>Delete</button>
theano	theano@gmail.com	34	female	600	67	113.566	93.963	weight-loss	intermediate	female	Angel	<button>Edit</button> <button>Delete</button>

4 Conclusion

This project described the development of a personalized fitness web application called StarFit as a solution to increase the motivation for exercise and attempt to eliminate the problem of physical inactivity in people's lives. The paper explored the relationship between technology and physical activity and stressed the most critical health related problems, based on the WHO's survey findings, that are caused by physical inactivity nowadays. After a detailed examination of the web personalization concept and delivery of data tailored to the user's preferences and needs, a specific personalisation technique was chosen for the personalization of StarFit web application. Then a thorough description of the development process of the StartFit application was followed and a detailed explanation of the code with a focus on the most important features of the web application. StarFit is a web application with the aim to simulate a personal trainer that provides exercise plans

4.1 Achievements

There were certain aim that were set at the beginning of the project which are achieved at the end:

- The development of a dynamic website that through the use of algorithm delivers personalised content to users based on their preference.
- The implementation of implicit personalization which is achieved through online registration forms among others.
- The creation of algorithms and conditions in PHP that are used for delivering relevant content to the users based on their input.

4.2 Future Work

Development

There are various areas of development that may be further improved:

Richer Online Forms

The registration form could be further enriched or more forms may be added in order to offer users the chance to provide more details about their daily life, including profession, marital status and country of residence. Therefore, the database could be enriched with more articles and workout plans in order to provide users with more detailed and relevant content according to their preferences.

Social Networks

Integrating the social networking functionality including social networks such as Facebook or Twitter could further enrich the experience of the user since it allows them to communicate and share their status and progress with other members.

Gamification

Knaving and Björk define gamification as ‘the use of game design elements in nongame contexts’ (2013). The sense of game and completion can make the web application more attractive to people with less or no motivation and effectively engage them in physical activity (Knaving and Björk, 2013).

Mobile Application

A great improvement could be the development of a mobile application that would utilised the hardware of the mobile device such as an accelerometer or pedometer in order to allow users to track their activity time and potentially heart rate.

Business

The existence of the content management system creates the possibility for the StarFit web application to be used by personal trainers as a tool to add new clients, manage their progress of their clients and create workout and nutrition plans that are fitted to their needs. In this way, it is the responsibility of the personal trainer is responsible for creating and inserting the workout and nutrition plans and send them to their clients via email or by including them in their profile.

Beyond its use as a software tool for personalised training, Starfit web application has also the potential to be the starting point for the operation of a health and fitness club. This can be achieved through advertising via the website as well as through collecting the users’ locations and identifying the ones with the highest demand for a health and fitness centre. A health and fitness centre must be able to provide a safe and motivating fitness environment with a range of facilities and equipment that can satisfy the needs of all its members.

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