**Module: Interactive System Design**

**(ECS733P)**

***Group Coursework:***

***Sportify Application***

**Link to the final prototype:** [**https://pr.to/GE68A8/**](https://pr.to/GE68A8/)

Group Members:

1. Pedro Sánchez Álvarez

(170779780)

1. Sankun Liu

(170740414)

1. Daniel Michael Dignam-Murphy

(171020593)

1. Sarang Sanjay Kharche

(150740395)

**Table of Contents**

[Module: Interactive System Design 1](#_Toc510115560)

[(ECS733P) 1](#_Toc510115561)

[1. Executive Summary 4](#_Toc510115562)

[2. Introduction 4](#_Toc510115563)

[2.1 Objective of this project 4](#_Toc510115564)

[2.2 Iterative cycle 4](#_Toc510115565)

[3. Personas 5](#_Toc510115566)

[3.1 Persona based development 5](#_Toc510115567)

[3.2 Research and initial cast 5](#_Toc510115568)

[3.3 Primary persona development 6](#_Toc510115569)

[4. Application concept and structure 7](#_Toc510115570)

[4.1 Key features based on Joe’s goals and frustrations 7](#_Toc510115571)

[4.2 Theme 7](#_Toc510115572)

[4.3 Main elements 8](#_Toc510115573)

[4.4 Conceptual Model 9](#_Toc510115574)

[5. Prototype design cycle 9](#_Toc510115575)

[5.1 Storyboard for conceptual model. Generation 0 9](#_Toc510115576)

[5.1.1 Objective of the prototype and main features 9](#_Toc510115577)

[5.1.2 Problems found 10](#_Toc510115578)

[5.1.3 Final outcomes 10](#_Toc510115579)

[5.2 First generation. Pen and paper sketches 10](#_Toc510115580)

[5.2.1 Objective of the prototypes and main features 10](#_Toc510115581)

[5.2.2 Evaluation 11](#_Toc510115582)

[5.2.3 Problems found 12](#_Toc510115583)

[5.2.4 Final outcomes 13](#_Toc510115584)

[5.3 Second generation. Main screen sketch prototypes 13](#_Toc510115585)

[5.3.1 Objective of the prototypes and main features 13](#_Toc510115586)

[5.3.2 Evaluation 14](#_Toc510115587)

[5.3.3 Problems found 15](#_Toc510115588)

[5.3.4 Final outcomes 15](#_Toc510115589)

[5.4 Third generation. Interactive prototype 15](#_Toc510115590)

[5.4.1 Objective of the prototypes and main features 16](#_Toc510115591)

[5.4.2 Evaluation 16](#_Toc510115592)

[5.4.3 Problems found 16](#_Toc510115593)

[5.4.4 Final outcomes 17](#_Toc510115594)

[6. Evaluation Methods 18](#_Toc510115595)

[6.1 Importance of methods 18](#_Toc510115596)

[6.2 Quick expert evaluation 18](#_Toc510115597)

[6.2.1 Summary 18](#_Toc510115598)

[6.2.2 Evaluation process 18](#_Toc510115599)

[6.3 Quick user evaluation 18](#_Toc510115600)

[6.3.1 Summary 19](#_Toc510115601)

[6.3.2 Task-based evaluation process 19](#_Toc510115602)

[6.4 Rigorous expert evaluation: heuristic evaluation 20](#_Toc510115603)

[6.4.1 Summary 20](#_Toc510115604)

[6.4.2 Evaluation process 21](#_Toc510115605)

[6.5 Ethics 21](#_Toc510115606)

[7. Summary 22](#_Toc510115607)

[8. References 22](#_Toc510115608)

# Executive Summary

# Introduction

An overview of the main objective of the project and the process followed is given in this section. This will provide enough information to understand the structure of following sections regarding personas and the prototype design cycle.

## Objective of this project

The aim of this project has been developing a smartphone or tablet application that encourages older people to be more active. No restrictions for the theme or focus of the design were imposed, except for the condition of being **very, very easy** to use.

In order to achieve this task, two main problems had to be addressed. First, a significant percentage of the user population might be very limited in the amount and of physical exercise that they can perform. Second, a high part of the target users is likely to be unfamiliar with smartphone technologies, making the objective of creating an easy to use interface even more challenging.

Therefore, in order to achieve satisfactory results, it became crucial to follow a design process that focused on the user and built the entire application around its very specific needs and goals. This process involved doing research into the user population, defining an archetypical user that would guide development decisions, and a keeping design methodology that carefully reflects on, tests and refines every interaction feature, in order to suit the needs of the specific user.

## Iterative cycle

The design process followed has an iterative approach, consisting on reflecting on a given set of problems, developing a solution, testing it and using the results to begin a new iteration of these steps (reflection, development and test). This cycle is repeated until a satisfactory, ideal result is achieved.

By using this approach, multiple design options can be implemented and tried. Consequently, on each iteration the interactive system will be refined and optimised, by removing problematic items and adding alternative options. This way it is ensured that only the most suitable interaction features remain in the final design.

In this particular project, several iterations of this cycle have been accomplished, giving as a result a high number of prototypes. For the sake of simplicity, iterations have been grouped into what has been called *generations*. In this report, the term *generation* refers to a group of iterations in which all the prototypes were designed with the same or similar tools and served the same purpose. Therefore, a change in the generation involves a big leap in the design process. At the same time, in one iteration several prototypes might have been developed simultaneously.

# Personas

In order to focus the design process about the user and its particular need, a method called persona based development has been used. This section provides a short introduction to this method, and explains in detail the process followed to develop the primary persona that would help orienting the design.

## Persona based development

Persona based development is a method in which a fictional user is created and serves as a centre point for the application development. As a consequence, users become the main priority, focusing the design team on the needs of the user population they are designing for.

A persona is a “precise description of our user and what he wishes to accomplish” (Cooper, 1999). Personas are archetypical characters based on knowledge of real users, and they represent people with similar background, life choices, technology knowledge etc.

This development method involves developing a cast of multiple personas based on research (surveys, interviews, demographic data, etc.), from which a primary persona is created. This primary persona will guide and focus the design process, helping to avoid generalisations and not addressing the specific needs of the target user population.

## Research and initial cast

Before developing a cast of personas, some research was made in order to gather data about the target user population. This was done online, and it helped to define an age range and find out how elder people are related nowadays with both, technology and physical activity.

First, it was necessary to define the scope of what “old people” means. The lower age limit was set to 65 years-old, which is the current retirement age, according to (gov.uk, 2014). Then, it was important to decide whether an upper limit would be necessary, to avoid trying to create an application aimed at people unable to do any physical activity. According to (Shepard, 1998), people over 85 start to become totally dependent, unable to exercise. Therefore, including people over 85 would derive in designing an application for people who will not use it. Consequently, even though the resulting application could be very useable, it would not be used. As a result, the decided age range was from 65 to 85 years old.

Then, in order to gather information of the relation of the elder with technology, it was decided to observe their behaviours and reactions in front of the most modern devices. This was done by reviewing the series of YouTube videos “Elders React to Technology” (<https://www.youtube.com/watch?v=PlM9SDsERIQ>). In these videos a group of older people are showed advertisements of new technology gadgets while they are being recorded. This allowed to see their response, thoughts and comments about devices like the Apple Watch or the iPhone X. These are far from being as useful as carrying out interviews in which questions can be prepared to get a deep understanding of how target users use technology. Nevertheless, given the lack of time and resources, it was a suitable solution to get a grasp of how elders interact with technology nowadays. In fact, they were useful to realise that elders within the defined age range are familiar with technology to some extent: they might not be experts or even fluent users, but certainly they are not absolutely technology illiterates, and are used to deal with gadgets in their daily life.

With this information, a cast of eight personas was developed. These personas were then analysed one by one to find out which ones were more representative of the target user population. An idea to create the primary persona came as the result of this analysis.

## Primary persona development

In order to create the primary persona that would serve as a guidance through the entire design process, it was decided to merge features two personas from the already designed cast: Pushpa and Mario.

Pushpa (Appendix A-2) is a 74-year-old housewife. She is an active woman, with a strong health (apart from being partially deaf), and she enjoys her ability to keep doing household tasks, like grocery shopping and cooking for her family. She is also a very naïve technology user, knowing how to use basic computer and smartphone functionality, like searching in google, playing mini-games or reading and sharing pictures in Facebook.

On the other hand, Mario (Appendix A-2) is a 72-year-old former home appliance fixer. He is lazy, unsociable and has several health issues, needing to take multiple pills three times a day. He is an experienced computer user, owning a PC that he built himself, and even though he mostly uses it to watch movies and series and play cards, he knows his way through complex procedures like OS installation.

Having these two personas in mind, it was decided that the primary persona should address needs like Mario’s health problems and sedentary lifestyle. If the application is suitable to encourage personas with these characteristics to do physical exercise, it will likely also encourage people with healthier and more active lifestyles, since they would already be keen on exercising, and they would not be impeded by disease. However, the primary persona should not be a technology expert like Mario, since developing an application for someone with that degree of knowledge would rule out novice or even intermediate users.

However, Pushpa’s degree of expertise would suit a primary persona, since designing for her would derive something usable for both, novices and experts. At the same time, someone who is sociable like her is more likely to be motivated to exercise, since she can be encouraged by friends and family. For Mario, for instance, it is likely that an application helping to be more active would go unnoticed, since he is not keen on exercising and has nobody (except his wife) to motivate him. Therefore, as it happened when defining an upper age limit, it would not be sensible to design for someone who is not sociable, since the application is likely to be unused by that kind of people.

Therefore, Mario’s health issues and sedentary habits were mixed with Pushpa’s expertise of technology and social relations in order to create the primary persona: Joe Smith. Joe (Appendix A-1) is a 74-year-old retired plumber, who enjoys meeting his friends in the bar and spending time with his grandkid. His main concern regarding health is his back pain, that does not let him stay in the same position for more than fifteen minutes. At the same time, he is a great football fan, and he spends most of his day watching matches and highlights on TV. He is not a complete technology illiterate, since he used to have a computer in his workshop, but he does not explore or go beyond his own boundaries. This could be described as: he only does what he has been taught to do. He owns an Android smartphone and he is a Facebook user, even though he does not upload things, but only read and share posts.

# Application concept and structure

This section include the details regarding the theme of the application (and how it was conceived) and

## Key features based on Joe’s goals and frustrations

In order to come up with the main requirements for the application it was important to focus on Joe's core goal: he wants to spend time with his grandson and teach him how to play football. The application should encourage him to achieve this goal leading to two conditions: encourage activity with a partner, and have some relation with football. The first one will not only help him achieve his goal, but it will also engage his grandkid, who might push him when he does not want to do the activity. The second one will make the application appealing for him in the first place.

On the other hand, Joe suffers from back pain when he stands up for a long time. Consequently, he will not be able to play for an entire hour or move in excess. This suggested the idea of promoting activity in a short dose each time.

At the same time, Joe’s sociability was used as an advantage to keep him motivated. It was thought that he could interact with the application by sending proof of doing some physical activity and getting feedback and approval by his friends. This would help him be engaged and/or competitive.

## Theme

This application will send Joe each week three challenges, each one of them related to a sport of his preference. These challenges consist on basic exercises, that can be done in twenty minutes or less, and are encouraged to be completed with a partner (e.g., passing a ball, shooting to goal posts, etc.).

Each challenge is explained in a few steps (ideally no more than three), and when the challenge is done, he must submit a picture or video of him completing the challenge. Once he submits it, the picture is shared in Facebook, and he receives a score. It is important to highlight that the score is not dependent on his performance, but on whether he did a challenge on time, rather than leave it for a different week. That is, he will receive 200 points for completing a challenge sent on the current week, and 50 points for completing challenges from past weeks. This will give him the possibility to catch up with previous challenges if he feels active, but the fact that challenges must be done when they are sent is stressed.

He will also have the ability to see his friends’ activities using the application via Facebook or within the app itself. Moreover, he will be able to compare his with his friends’ scores thanks to a rank table.

## Main elements

In order to present Joe, the explained theme in the form of a mobile application, it is necessary to clearly define each of the elements that are involved in order to establish a solid background for the design of the application. These are:

* **Challenge:** Challenges contain the steps users must follow to do the activity, the number of points they provide (which changes depending on whether they are current or past Challenges), and the Joe’s submission. They are defined by the Week in which they appeared and the Sport they are based on.
* **Challenge steps**: Instructions required to achieve a Challenge. Ideally, there will be three steps in every challenge. Joe will have to follow each step in the Challenge and send a Submission when the last step is completed.
* **Submission**: Picture or video sent by Joe when he has completed a Challenge. This will be shared in Facebook, and it will be visible for his Friends, in Facebook and within the application. It will also give Joe some points that will be added to his Score.
* **Score**: Total of points that Joe has gained by completing Challenges. This will be visible to the rest of his Friends, and he will also see his Friends’ respective Scores.
* **Sport**: Joe will be asked to select three favourite sports at the very beginning when they use the system. Each of the three weekly Challenges will then be strictly related to each of these sports.
* **Community**: Users are only allowed to login the app with their social media account, in community they can access their own and friends' moments of challenges and interact with them.
* **Week**: Collection of three Challenges, that updates weekly. The Week in which a Challenge is in defines the number of points that are obtained when it is achieved (200 for current Week’s Challenges, 50 for past Weeks).
* **Ranking:** Table containing Joe and all his Friends ordered from high to low by their Score.
* **Friends:** Group of Joe’s Facebook friends who are also using the application. He will be able to see their Score, Name and Submissions within the application, and he will also be able to see their Submissions in Facebook.

## Conceptual Model

To define the conceptual model and how the different elements will be related in the application, it is important to analyse how they should be presented in order to make it as easy as possible for Joe to understand and use. Therefore, the first thing to consider was: How are going to be Challenges presented? Given that new Challenges are sent weekly, and that the points they give depends on when they were sent, it is sensible to present Challenges for the same week presented as a group: that was how the Week element was added.

Then, provided that each Week is updated each real-time week (just as in real life), it makes sense to present Weeks in chronological order. The approach decided to convey this idea was to present them as a list with most recent weeks on top. This way the most important items (i.e., the newest ones) will always be shown first. In order to find the older ones, a natural mapping (a sequence of Weeks) is provided. This list was called the Week Calendar. All the structure contained within a Week calendar (Weeks, Challenges, Steps, etc.) was defined as the Activity Structure. A diagram presenting this structure is shown in Figure.

On the other hand, information about Joe is stored in the Personal Data Structure, that contains his Score, his Sports selection, and his Profile, extracted from Facebook. Finally, all the information about his Friends (Name, Score and Submissions) it is united under the Social Structure.

The Personal Data and Social structures are related through the Ranking element, that shows how is Joe related to his Friends according to their Score. This element will help him become engaged by the competition with people he knows. The reason to make everything related to Facebook, rather than creating a parallel social network, was to make things easier and less confusing for Joe, since he is already a Facebook user, and managing with a new account, and starting to look for friends in a new environment could be tedious for him. At the same time, it would allow him to engage with the application using Facebook without a big effort.

The Activity Structure is related to the Personal Data Structure through the Sports element. Sports selection is defined by Joe and stored in his personal Data, while it defines the kind of challenges that are visible for him.

# Prototype design cycle

## Storyboard for conceptual model. Generation 0

### Objective of the prototype and main features

This first prototype was designed while working on a theme for the application. The first idea consisted on designing an application to make long term craft in collaboration with his grandson, which would encourage Joe to engage with some regular activity.

In order to devise how such an application could fit into Joe’s life and how would he use it, a quick storyboard was created, explaining step by step a scenario in which Joe interacts with this hypothetical application.

Notice that no features or interaction methods were explored in this prototype, but it was only used to visualize how Joe could incorporate the application into his daily life, which could bring up problems in the main concept of the app.

### Problems found

The storyboard helped to find out some fundamental problems regarding the concept of the application. For example, this early idea was based on craft projects, which required Joe to go shopping for materials. This would be an issue since he might not find the required components near his home at the time he needs them, and they cost money that, in the long run, he might not want to pay. Moreover, the fact that they involve long term projects could be discouraging, because if one step is missed (e.g., his grandson is not available that week, he has not been able to find the materials, or he simply has a week busier than expected), the whole project is condemned. Moreover, even though Joe enjoys helping his grandson with school projects, none of his goals are related to this, which means that this application might not be appealing enough.

### Final outcomes

As a consequence of this reflection, it was decided to create weekly challenges, that could be done in less than 20 minutes. This approach was adopted to avoid forcing Joe to spend a lot of time each week on the application (which might discourage him from using it) and to overcome his back pain, since he cannot move for a long time as a consequence of it (Appendix C-1 Figure 2).

At the same time, the focus of the challenges turned from being crafts related to sports tasks. This would help Joe accomplish his goal of teaching his grandkid about football. Long term engagement would be achieved by a scoring system that allows him to compare himself and compete against his friends.

## First generation. Pen and paper sketches

### Objective of the prototypes and main features

This generation of prototypes involved three iterations of the process described in Section 2.2, during which four prototypes where developed (two prototypes in the first iteration, one in the second, and one in the third). The purpose of these prototypes was to explore different layout, interaction and navigation possibilities, testing new ideas and reflecting on the results in order to find out the best options for the design. Consequently, by the time this stage finished, a solid foundation for a higher fidelity implementation had been achieved.

These prototypes where implemented as pen and paper sketches. This allowed to lay ideas down quickly and easily, encouraging experimentation over a wide range of concepts at no significant cost. Moreover, modification of the prototype is immediate, helping to create and reflect over a high number of design possibilities in a short amount of time. This is especially desired at this stage, in which ideas are likely to be imperfect, since it helps to localize and fix major interaction issues in a fast way.

The first two seminal prototypes presented the following features:

* A main screen that displays the name and a sample video of current’s week challenge for a specific sport. Past weeks’ challenges can be accessed by swiping down or pressing an arrow button. This presents challenges as a vertical list. It was called “Main” screen.
* When the name of a challenge is pressed, the information of the first step of the challenge appears. Next steps can be accessed by tapping arrow buttons or swiping left and right. This was called “Challenge” screen.
* The community screen can be accessed from a button in every other screen. This shows a different screen that presents community information in the same fashion as Facebook’s feed. This was called “Moments” screen.
* Different sports are selected by three toggle buttons. When the button corresponding to a specific sport is pressed, the challenge displayed in the main screen corresponds to the one selected on the button.

The purpose of this layout was to present challenges linearly, giving the impression of a chronological order (as devised in the conceptual model, explained in Section 4). At the same time, they appeared to present information in a clear way, that could be easy for Joe to follow (more in 5.2.3). Moreover, in order to keep Joe oriented through the whole interaction process, both of them tried to implement all these features in just one screen (i.e., the information displayed changes, but the background context remains the same). The main difference between both prototypes was that one of them tried to emulate Facebook’s interface. The idea behind it was to present a system with which Joe was already familiar with, as it is Facebook. However, as explained later in this section, this option was finally discarded, even though some features were taken from this for the final design. (Appendix C-2 Figures 3, 8, 11-16)

The two prototypes developed in the two subsequent iterations kept this set of features, following the aesthetic approach of the non-Facebook interface. Nevertheless, the fourth one implemented within several screens, to fix problems found in evaluation (see 5.2.3). Overall, they served to fix important visibility and mapping issues found in the two previous prototypes, giving a strong starting point for higher fidelity implementations.

Don’t forget to include figures where appropiate

### Evaluation

All of these prototypes where evaluated using a quick method (see Section . Be more precise when this section is written). This was preferred instead of a more rigorous approach because it allows to gather information about major problems in a fast way, before working on more polished and complex design.

The two prototypes on the first iteration were evaluated by four experts (see Section . Be more precise when this section is written). There were two reasons to use expert evaluation. First, it was desirable to have experts’ rich and elaborate insight, rather than users’ real (but not self-explanatory) reactions, since those first prototypes were very rough sketches and it was important to find the correct problems to avoid developing in the wrong way. Second, user evaluations are slower, and it was important to quickly developed newer versions of that design.

Nevertheless, for the next two iterations, user evaluation with an explorative approach was used. At that stage, once the basic navigation layout had been fixed, it was important to find out real issues faced by users, rather than predictions from an expert. This allowed to polish the interactions to develop a solid foundation for future prototypes.

Show proof of this evaluations.

Prototypes were tested with three participants (two users evaluating the first update, aged 22 and 54, and one user evaluating the last update, aged 23). The reasons not to use participants in the defined age range was that they became difficult to find, and this was a quick and dirty evaluation stage to develop new prototypes as fast as possible. Moreover, any navigation difficulties found by 22-year-old users, who are familiar with technology, are likely to be as well for Joe.

Maybe the justification of age should appear in the end, given that no final user evaluation has been done

### Problems found

After evaluating the first two prototypes the experts provided the following insight regarding both of them:

* + Screens were overcrowded with information, which could be confusing for Joe.
  + Smartphone screens may not have enough space to display every item present on the prototype.

Moreover, in the case of the non-Facebook prototype, they added that the screen featured too many interaction possibilities (e.g. scrolling left, right up, and down; too many buttons to press, etc.). This could easily lead Joe to make mistakes when using the app.

Nevertheless, all experts agreed on the fact that this prototype provided more functions and better usability than the Facebook-like one. Moreover, even though Joe knows how to use Facebook, he is not its target user. Therefore, it would be better to design something from scratch especially aimed at him, rather than relying on his familiarity with another application. This led to discontinuing the development of new versions of the Facebook-like prototype, to focus on the other approach.

Consequently, the non-Facebook version was the one developed through another two iterations, trying to fix the issues found by experts. The third prototype (on the second iteration) had some changes in the layout and navigation (mainly removing and replacing a few buttons) while keeping the idea of avoiding screen jumping. This version was tested with users, obtaining the following results:

* + Every user missed to press the challenge button in the “Main” screen.
  + Participants showed difficulty navigating between screens.
  + Participants did not seem to realise the importance of community feedback in the application.
  + Participants generally did not feel each challenge was a compulsory task, but rather a proposal of what to do that week.

After this evaluation, it was decided that the fourth version would break with the previous conception of no screen jumping, implementing the same functions in different screens. It was realised that the confusion participants experienced was likely due to the amount of information present in the screen. Therefore, it would be better for Joe to use different screens, as long as they are simple, and efforts are made to keep him oriented. Consequently, it was possible to make the fourth version include screens with a more minimalistic design, and a cleaner layout.

However, when the new version was evaluated with more users, results were very similar to the ones showed from the previous user evaluation. Even though most mapping and visibility problems had been sorted (e.g., participants did not realise how to navigate through challenges in the main screen, and that was solved by hinting the corner of the next challenge box in the bottom of the screen), and navigation within each screen had been made intuitive, major issues remained regarding critical functions in the “Main” screen.

### Final outcomes

This generation of prototypes, through its three iterations, helped to lay down the main skeleton for the application and get a solid notion of which features the system should have. On the other hand, the set of problems that resulted from multiple evaluations suggested that the conceptual model was not being properly conveyed in the main screen of the application.

While users could easily navigate and understand the “Challenge” and “Moments” screens, they usually missed the fundamental functions in the “Main” screen, and what is more relevant, they were not understanding the overall philosophy and intention of the application: keeping a habit of practising sports on a weekly basis. On the contrary, they thought that the “Main Screen” was a menu from which they could choose any challenge, and that it was being weekly updated. Therefore, the next step was to go back to the model, review it, and devise a new layout that would appropriately display that idea. Moreover, the next prototypes were implemented with higher fidelity, in order to eliminate problems derived from the rough prototypes. These prototypes are explained in Section 5.3.

## Second generation. Main screen sketch prototypes

### Objective of the prototypes and main features

This generation includes nine prototypes, developed through three iterations. In order to fix the problem of the previous generation, the intention was to create a design that would effectively communicate the ideas from the conceptual model, directly on the main screen. Therefore, after the last evaluation of the first generation, the conceptual model and former prototypes were reviewed and reflected on, in order to find an appropriate approach.

This time prototypes were developed as virtual graphic designs rather than pen and paper sketches. At this stage, the design was strongly reinforced by color and the shape of objects. Therefore, a higher implementation was needed to avoid problems related to the roughness of low fidelity prototypes interfering in the evaluations. Consequently, due to the fact that still several ideas had to be tested, only the design for the main screen was created. This way, time could be employed on developing different options of the main screen rather than creating one full prototype.

The main features of prototypes in this generation were:

* Challenges are presented as a vertical list in chronological order, that is, most recent challenges are at the top.
* Challenges for different sports happening on the same week are grouped in the same row. Each challenge is represented by a box with a signature colour. Therefore, each row (representing a specific week) contains three boxes of different colours, which are the challenges. Pressing these boxes open the selected challenge screen.
* Each box has a label specifying the score that is obtained (or has been obtained) when doing that particular challenge.
* A bar at the bottom of the screen has buttons to select the main screen, the community screen or the profile screen.
* At the top, there is a trophy sign showing the score, that shows a ranking page when pressed, and a settings button.

Apart from these shared features, each prototype had some unique characteristics. For instance, the prototype in the first iteration did not include text, and it was used to see whether the visual elements were enough to provide information. The next seven prototypes (developed during the second iteration) were a more complete version of the previous one, including text, images, and refined colours and shapes. These seven were exactly the same as each other, except for slight details (shadows, pictures, etc.). They were created to observe how subtle details affected the design. The prototype in the last iteration is the mainly a polished version of the previous ones, and it was intended to be the one appearing on the final interactive prototype. It includes schematic pictures of the sports on each challenge box and the almost final design for score presentation.

### Evaluation

The main issue that had to be tested with this design was whether Joe would press the right buttons, due to the expected reasons: this would mean that the conceptual model had been appropriately communicated. Therefore, user evaluation was needed, because participants would provide a ‘real’, instant reaction, rather than the theoretical prediction from experts. Once again, a quick method (see Section . Be more precise when this section is written) was used to test all the prototypes, since the objective was not to do a deep analysis, but only see if the main functions were explicit enough. At the same time, it was likely that multiple iterations had to be done, which means that a rigorous approach would more time than desired (especially compared to the overall benefit that would be obtained from it). However, this evaluation used a task-based approach (see section), since only one specific element of the design was being tested.

Show proof of this evaluations.

A total of six participants tested this generation of prototypes (two users evaluating the first version, aged 15 and 25; one user evaluating the second update, aged 20, and three users testing the third iteration, aged 22, 23 and 32). It is necessary to highlight that, from the seven prototypes developed in the second iteration, only one of them was tested. The rest of them were created to compare the effect of different details, and finally the one that was considered the best was the one evaluated, since evaluating all of them would be excessively time consuming. It was selected according to minimal design, visibility and mapping criteria (i.e., the one that was able to transmit more critical information with less visual cues) (Appendix D-1.3 Figure 20). On the other hand, since this iteration did not add new features, but simply made the previous version more explicit, this evaluation was used as a control test, to check if anything important had been lost in the evolution.

### Problems found

These are the main common results obtained from the three user evaluations:

* The icon near the score looked like a button, when it was not (sorted by putting a button there).
* The tool bar icons were not clear and did not match participants expectations.

Moreover, in the case of the first iteration, users interpreted that there were three columns that could be independently scrolled maybe add figures. Apart from these issues, evaluation results showed that the application worked as expected: users pressed the button for the current week, because they felt it was the one they had to do. Also, when asked to review past challenges, they scrolled down with ease. At the same time, post-evaluation questions for the second and third iterations were asked to get qualitative insight, and all answers suggested that the participant understood the philosophy of the application (i.e., that challenges should be done on the same week they are sent, as a “compulsory” task) just with that screen.

On the other hand, the mentioned problems did not have a difficult solution. For instance, in the case of the trophy, due to the fact that participants thought it was a button was dealt with by adding a functionality to that icon (see 5.4 for more information). At the same time, tool bar icons were changed for the next generation, looking for consistency with already existing applications, in order to fit Joe’s pre-conceptions.

### Final outcomes

This generation of prototypes was intended to focus the design task on two major issues: appropriately communicating the conceptual model, and drawing enough attention to the main buttons on the “Main” screen (i.e., the challenge buttons). Results from evaluations showed that concentrating the effort on a single task had been worth to effectively solve those problems in an elegant and simple manner. The outcome of this generation was a prototype of the “Main” screen that could be easily transferred into a new interactive prototype and integrated with the rest of the screens.

## Third generation. Interactive prototype

### Objective of the prototypes and main features

Two iterations of the process were done, during which two prototypes were created. The final interactive prototype of the application, that is the objective of this entire project, had to come as a result of this generation. Therefore, these two prototypes intended to emulate the functionality of a real smartphone application that fitted Joe’s needs. The first of the two was intended to test the designed interactions in a responsive system (which was not the case of the previous prototypes) and see whether they were as intuitive and immediate as expected. The second one consisted on refining the previous iteration by adding some minor features and use feedback from the evaluation in order to provide the most polished version of the application, that it is hopefully the best.

This generation of prototypes was developed in “proto.io” prototyping application, a tool that allows to implement interactive functionality, without the need of coding the back-end software that would be needed for a real application. Given that the outcome of the generation would become the definitive version of the app, it was decided to implement as many of the planned functionalities as possible, using all the information gathered from throughout the whole process as the basis.

A walkthrough of the final version, with all the implemented functionality, can be found in Appendix D-2, along with a link to its “proto.io” URL. The first iteration looked the same in the fundamental. The main differences with the final one is:

* It only included the crucial functionality (i.e., “Main”, “Challenge” and “Moments” screens), while some screens and functions had not been implemented (e.g., the screen to submit the picture, the sport selection screen, the login confirmation screen, etc.)
* A good number of icons were changed for the final version (e.g., the settings icon, the “likes” icon in the “Moments” screen).

### Evaluation

Expert heuristic evaluation, following a rigorous approach, was carried out (Section 6.4). Five experts evaluated the prototype.

In the final stage, not a lot of iterations were going to be done, since most elements had been already tested. Therefore, using a rigorous approach was important to get some controlled and measured feedback before implementing the final version. This way, it would be ensured that no important flaws would remain in the definitive prototype, as a consequence of having overlooked them during quick evaluations. On the other hand, expert evaluation was chosen for two main reasons. First, resources and time were limited to conduct an effective user evaluation. Second, since only one evaluation was going to be carried out, information should be as rich as possible and, as it has been mentioned previously and is explained in Section 6.2, information obtained from user tests is limited.

### Problems found

Overall, experts gave very diverse information. The main issues were related to error prevention, help and documentation and ambiguity in icons. Nevertheless, when reading expert’s reports on error prevention and handling, it was realised that they referred to how errors were managed in case that the application failed, rather than what would happen in case that users failed when using it. This was assumed as a sign that no expert found any situation in which the user was prone to make a mistake that was difficult or impossible to undo. At the same time, the fact of not including any explicit help and documentation was a design decision, taken to convey as much information as possible with the minimum amount of text. If this was done right, no help or documentation would be needed.

Regarding ambiguity in icons, it was mainly due to inconsistencies with already existing models (e.g., the hamburger button leading to a Settings screen rather than a drop-down menu or using hearts instead of Facebook’s “thumbs up” to like others’ activity in the “Moments” screen). The solution to that was reviewing some already existing applications and changing the icons to fit the already existing models and standards.

Apart from these issues, some experts provided feedback on visibility, but most of the recommended changes had already been tried in previous prototypes (e.g., using bigger boxes for current week challenges in the “Main” screen), and proved to be confusing for users. At the same time, many of them found the prototype limited in functionality. However, this was a consequence of not having implemented some functions that were meant to be ready for the final prototype.

### Final outcomes

After this generation of prototypes, the definitive high-fidelity prototype was created. It is important to notice that no major changes were done through these last iterations, thanks to the multiple versions that had been previously developed to test a wide variety of ideas and possibilities. Therefore, a prototype with refined interactions, tested in several trials, consistent with already existing standards, has come as the final result.

It is important to highlight that this last prototype has limitations regarding some features, due to “proto.io” limited options. The main differences between the actual prototype and the intended idea are:

* The “Challenge” screen is the same for the three sports in this case, but it actually was conceived to be different for each challenge, having the same background colour as the one of the selected sport.
* The “Sport Selection” screen allows to choose more than three sports when it was intended to be limited to three.
* When navigating between “Main”, “Challenge” and “Moments” screens, they were intended to move right or left, depending of the position of the icons in the toolbar.

# Evaluation Methods

## Importance of methods

## Quick expert evaluation

### Summary

Quick expert evaluation methods consist on having an expert evaluate the prototype by analysing each feature in order to predict potential interaction issues. Unlike the case of more rigorous evaluations (see Section 6.4), a clear and fixed methodology is not followed, being the examination criteria left up to the evaluator.

These methods are intended to provide richer and quicker information than user evaluations, since no user recruitment is needed, and experts might be able to give explanations on usability issues that users cannot give.

Quick expert evaluation was used to evaluate the first two iterations in the first generation of prototypes (see 5.2.2).

### Evaluation process

The primary persona (i.e., Joe), and a general idea and the basic functionalities of this app are introduced to the evaluators before starting. The prototypes are then tested by each evaluator individually, following this process:

1. Evaluators are asked to navigate the prototype and take notes or leave verbal comments about the potential usability problems they find.
2. Evaluators are free to ask questions about the elements that they do not understand from the prototype.
3. While they are navigating, feedback that is not shown is explained to them by experimenters verbally or drawing.

In the end, evaluators explain the potential problems they found, and give suggestions on how to improve the design. A single test usually takes about 15 minutes.

## Quick user evaluation

### Summary

Quick user evaluation methods consist on having a user interacting with the prototype to observe their reactions and later give broad feedback on the design. Unlike the case in more rigorous evaluations (see 6.4), these methods are quick and give frequent feedback information on the design.

These methods are intended to provide information about user thoughts on the application, user experience, there likes, dislikes and worries about the application. Moreover, using users instead of experts help to get information about what real interaction problems they might face and where the system goes wrong.

Two approaches were used in these evaluations: an explorative approach and a task-based approach. Explorative approaches consist on giving users an overview of the application and let them interact with all its features with freedom. On the other hand, task-based approaches require giving the user one or more specific tasks to accomplish

Quick, explorative user evaluation was used in first and second iterations of the first generation (see 5.3.2), and quick task-based user evaluation was used in first, second & third iteration of the second generation (see 5.3.2),.

Explorative Evaluation process

Before the evaluation, insight about ethics protocols and a consent form are given to each participant. The evaluation will continue only after they’ve read it carefully and signed on consent form. The prototypes are tested by each participant individually, by following the next steps:

* + - 1. The main idea and structure of the current prototype are introduced to the participant before the evaluation is started.
      2. During the evaluation, participants are asked to navigate the prototype without any instruction.
      3. While navigating, users are asked to think-aloud (i.e., describe why they are doing each action) and their critical behaviour and comments are annotated by experimenters.
      4. Participants are free to ask questions about the elements that they find uncertain about on prototype (due to, for example, very low fidelity design), but they will only be given hints after two minutes of being blocked.
      5. While they are navigating, feedback which that is not shown on prototype are explained by experimenters verbally or drawing.

In the end, participants are asked to comment the overall feelings of the interface, their understandings/thoughts of elements/functionalities and the elements that they like or dislike, to get qualitative information. A single test usually takes about 10 minutes.

### Task-based evaluation process

Before the evaluation, insight about ethics protocols and a consent form are given to each participant. The evaluation will continue only after they’ve read it carefully and signed on consent form. The prototypes are tested by each participant individually, by following the next steps:

1. The general idea and the main structure of the current prototype are introduced to each of them before it starts.
2. During the evaluation, participants are asked to complete some simple tasks (i.e., start a challenge or go to the profile) to test whether they understand the design. Meanwhile, their actions are annoted by experimenters.
3. While navigating, users are asked to think-aloud (i.e., describe why they are doing each action) and their critical behaviour and comments are annotated by experimenters.
4. Participants are free to ask questions about the elements that they find uncertain about on prototype (due to, for example, very low fidelity design), but they will only be given hints after two minutes of being blocked.
5. While they are navigating, feedback that is not shown in prototype is explained by experimenters verbally or drawing.

In the end, participants are asked to comment the overall feelings of the interface, their understandings/thoughts of elements/functionalities and the elements that they like or dislike. A single test usually takes about 10 minutes.

## Rigorous expert evaluation: heuristic evaluation

### Summary

Rigorous expert methods follow a clear and fixed methodology, consisting on a expert evaluating the prototype in detail, considering usability and user experience criteria. This method is important both to give a structure to ensure that no significant problems are missed and provide solid and reliable results.

Heuristic evaluation methods consist on having a small set of evaluators examining the interface and judge its compliance with recognized usability principles. In this case the followed being 5 or more experts evaluate against 10 criteria (Appendix E-2.2 Table 2).

These methods are intended to give feedback on the prototype that is relatively close to the artefact (final product), since more sufficient and specific feedback on potential usability problems is likely to be needed. At the same time, given that five or more evaluators are needed, this method has the advantage of avoiding biases since multiple experts are involved with defined protocols.

The rigorous expert evaluation was used in first iteration of interactive hi-fi prototype of the third generation as mentioned in 5.5.2.

### Evaluation process

Before the evaluation starts, the primary persona (i.e., Joe), the general idea and the basic functionalities of this app are introduced to each of the evaluators before starting. Besides, experimenters helped them to have a better understanding of Nielsen's "10 Usability Heuristics for User Interface Design" (Nielsen, 1995). The prototypes are tested by each evaluator individually. To avoid biases, experimenters make sure the evaluators do not communicate with each other about the evaluation until all of them completed.

1. During the evaluation, the evaluators go through the interface at least twice to inspect all the elements in the interface and compare them with the list of recognized usability principles.
2. Evaluators classify the usability problems that they found according to the mentioned principles, write down the problems in a specific way and rank the problem from 0 to 4, (0 being no problem and 4 usability catastrophe).
3. Evaluators are free to ask questions about the elements that they do not understand from the prototype.

In the end, the evaluators explain the problems verbally to experimenters before handed in the evaluation form, in order to obtain some qualitative information.

## Ethics

To test the prototype and get feedback various evaluation involving users where conducted. Ethical practices while performing these studies are just as important as developing the prototype itself, as it protects the interest of the user and the designer.

While performing user trials the specified guidelines were followed:

1. Participants are not exposed to any risks greater than those encountered in their normal working life.

2. Experimental materials are paper based or comprise software running on standard hardware.

3. All participants give explicit consent to take part.

4. No incentives are offered to participants.

5. No information about the evaluation or materials is intentionally withheld from the participants.

6. No participant under the age of 16 has participated without parental consent.

7. No participant has an impairment that might limit their understanding or communication.

8. I am not in a position of authority or influence over any of the participants.

9. All participants are informed that they can withdraw from the study at any time.

10. All participants are informed of my contact details.

11. Participants are debriefed about the aims of the study and given the opportunity to

ask questions.

12. All the data collected from participants is stored in an anonymous form.

Each member of the team signed a form stating that these principles had been followed, and this can be found in the Appendix F-1

At the same time, every user that evaluated the prototype was asked to sign the consent form shown in Appendix F-2. All these forms have been safely stored and can be referred to if requested.

# Summary

// I can reference the report using Harvard Style if required.

# References

Amble, S. W. (n.d.). *Personas: An Agile Introduction.* Retrieved from Agile Modeling: http://www.agilemodeling.com/artifacts/personas.htm

gov.uk. (2014, May 12). *State Pension Age Timetables.* Retrieved from Gov.uk Website State Pension Section: https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/310231/spa-timetable.pdf

Nielsen, J. (1995). *10 Usability Heuristics for User Interface Design.* Retrieved from Nngroup: https://www.nngroup.com/articles/ten-usability-heuristics/

Shepard, R. J. (1998). *Internet Society for Sport Science*. Retrieved January 10, 2018, from http://www.sportsci.org/encyc/agingex/agingex.html