Acknowledgement

University Campus Suffolk

PROGRESS Towards Healthy Ageing

App Development Report

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Contact b.noble@ucs.ac.uk
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INTRODUCTION

The purpose of the PROGRESS Towards Healthy Ageing project is to offer health policies that promote ‘healthy’ and ‘successful’ ageing in advanced years. Suffolk County Council are the lead in the project that comprises a collaboration of partners across five European states to identify innovative and practical ways to promote healthy and active ageing.¹ Focus is on targeting 45-68 year olds through workplace interventions rather than traditional health-related settings.

In the UK, 94% of adults own a mobile phone.² Of this percentage, 72% are smartphones.³ According to the 2011 UK Census this results in an estimate of 12.1 million people with smartphones over the age of 45. Health related smartphone apps can therefore make intelligent healthy living practises more accessible. Traditional health advice can inform people of the best way to maintain a healthy lifestyle; while this may increase an individual’s intention to change it doesn’t necessarily modify their behaviour. These changes require a more proactive intervention, a consistent and instant source of information.

Clearly, an app on a smartphone can reach a large number of individuals. The combination of the potential for an immediate source of information with a personalised level of feedback can assist the intention to change. With the ability to constantly remind a user of health and lifestyle related decisions that individuals make via their smartphone, the technology employed can also contribute to the modification of behaviour. A smartphone can also help to automate a portion of the data gathering associated with health and wellbeing studies by utilising its hardware and many sensors. For example, activity data no longer needs to be logged by the user; it can be automatically tracked using smartphone GPS technology and linkage to accelerometers.

Success in aiding healthy living can ultimately alleviate pressure on local care systems. In the short-term for example it could potentially reduce such issues as binge drinking, which could not only help reduce associated health issues but may also reduce drink related crime. In the long-term such technology could help to lower the risk of heart attacks, strokes, type 2 diabetes and other conditions that can be heavily influenced by lifestyle.

PURPOSE OF THE APP

The UCS Healthy App is designed to offer a mobile companion to any health programme including the Health Manager software currently being trialled to promote healthy and active lifestyles in the workplace.

¹ http://www.progresshealthyageing.eu/about-the-project/
² Ofcom Communications Market Report 2013
³ Deloitte Consumer Review 2013
Broadly the purpose includes:

1. Dissemination of health and wellbeing related advice
2. Collection of health and wellbeing related data.
3. To reach geographically diverse individuals and groups of individuals in regard to the above.
4. Contribution to sustained change in health related behaviours.
5. To maintain connection with study participants throughout and beyond the lifetime of any study.

The inherent limitations of software such as “Health Manager” include its mobility and the return rate of its users. Without adequate prompting individuals may forget to continue to update their health statistics. Individuals are also reluctant to report health data that is negative, striving to appear as healthy as they can. A mobile app can help towards overcoming these issues with a number of its features.

In order to serve its purpose the app needs to make answering questions significantly easier than standard questionnaires and, if possible, automate many of the processes.

The app has to be intuitive to use and be able to be understood extremely quickly. Apps are incredibly easy to access, but equally as easy to dismiss, therefore, if it appears difficult to navigate then users may lose interest.

An app also has to be pleasing visually and have a professional feel to its user interface. The initial reaction to the look and feel of the app is vitally important in retaining users.

A continued, regular notification from the app will prompt users to update their information within the app. Consistent notifications like this can work towards behavioural changes, with the user eventually updating information of their own accord through habit. Most people will carry their smartphones on them the majority of the time with the result that this sort of intervention is extremely effective. The skill here is finding the balance between being a helpful reminder and being annoyingly repetitive.

Data collection requires that connectivity with a central database is established and that data format is appropriate for direct entry into such a database. The opportunity to expand upon the range and type of data collected is key to future proofing the app and retaining relevance to new studies as they emerge.

THE DEVELOPMENT PROCESS

The timeline for the development was short. The development had to be centred around creating an app that was aesthetically pleasing and intuitive to use while making sure that the very core functions worked efficiently. The short timeline resulted in the necessity for a design that had core functionality that could be built upon beyond the lifetime of the project.
An initial focus group was established in order to ascertain the range of functions to focus on while creating a basic guideline as to how the user interface should be laid out. In order to deliver on time, development of the app had to run from the very beginning to the very end, with little chance during this process for redesigns (these will continue over time). As such, feedback on features and design was addressed when sub sections sections where completed rather than the traditional method of modifying versions of the whole app in a testing environment. While this approach was driven by necessity and was sub optimal, the outcome has been maximised through an energetic and cross-disciplinary approach to the development.

**FOCUS GROUPS & FEEDBACK**

The core concept behind the app, and the question put to participants of the focus group, was:

"Traditional health advice can do a good job at increasing the intention to become healthier. However it can only go so far in actually modifying behaviour. For example, attending a weight watchers group can help increase your intention to diet but once you are back home it's easy to slip back into regular eating habits. A health app on a smartphone, due to almost always being in your possession, can be a fantastic aid to help change behaviour and attitudes towards healthy living. What would the ‘UCS Healthy App’ have to provide to offer that support."

A few points were raised during the focus group. There was concern about the initial scope of the app being too ambitious. The main tasks that the app must achieve are:

1. Gathering information about personal health.
   - Since the app requires a user to sign in, it helps tie different questions and answers to a single user. This would allow correlating information, like stress levels and sleep duration, to be linked together making the data more revealing.

2. Tracking location
   - This allows the app to store accurate data about how active the user has been without the user having to interact with their phone. This feature enhances the data gathered from the app with almost zero effort from the user.

**DESIGN**

The User Interface (UI) design followed the principles of the main UCS website. The reasons for this were to emulate the ‘house style’ of the company and to borrow from an already proven design. The chief aspects of this are the ‘block’ style and specific UCS colours. The UI also had to reflect the overall aim of the app, a clean and calming appearance that is easy to understand.
The app was built using Eclipse, the recommended programming environment for Google Android applications. It was written in the Java programming language. Java has the advantage of being an Object Oriented Programming language which enables app development to be modular, flexible and extensible. Each individual aspect of the app was worked on independently and systematically. As each aspect was completed and deemed to be working it was subjected to testing by an independent party, allowing for every part to be tweaked and modified until it was fit for purpose.

Initially coding focused on making the app usable and stable. Care was taken to make sure the app wouldn’t crash unexpectedly leaving the user unsure what to do. Priority was given to aspects of the app that couldn’t be replicated by the Health Manager™ software, such as the GPS tracking. It was very important that features of the app such as this were functioning correctly in the first version of the app in order to give it value.

The UI went through many revisions during the course of the design process. The original design, based around heavy UCS style, quickly became unusable as more aspects of the app were completed and became functional. The design became cluttered and less intuitive the more the functionality was developed. A mobile app can’t be shipped with an instruction manual; it has to be instantly usable. The UI was simplified and restructured to boost usability and appeal. Companies like Apple and Google make it very easy to download apps, while this is excellent for distribution it also makes it very easy for an app to be disregarded. The initial impressions of an app are vitally important so it has to appear professional and well thought out.
The app at its current version has the following feature set:

- **My Profile**
  - A personal profile for each user.
  - Shows height and weight.
  - Will automatically calculate BMI here when updated.

- **My Progress**
  - Based on the user’s level of activity throughout the day the “Elf Monitor” will be in one of three stages of fitness; unhealthy, more healthy or fit.
The user also gets the very basic distance you have travelled today.

- **My Statistics**
  - Shows a breakdown of how far the user has travelled.
  - Broken down into:
    - Today
    - Yesterday
    - This Week
    - Last Week
    - This Month
    - Last Month
    - Overall

- **Questions**
  - Here the user can answer health related question.
  - Broken down into 5 categories:
    - Sleep
    - Nutrition
    - Alcohol
    - Smoking
    - Stress
  - There is also information about what different portion sizes mean for the nutrition and alcohol questions.

- **Extras**
  - Opens an app called ‘Heart Rate’ to measure the user’s own heart rate with. This feature will eventually be built into the app itself but time constraints made it impossible to include in the first version.
  - A ‘News’ section opens a page for viewing the latest news from UCS. In future versions this will be a dedicated health news feed.

- **Settings**
  - This page is a placeholder currently but a test build of the app already allows the user to change font sizes to improve app accessibility. Again, this couldn’t make it into the first version due to time constraints.

- **Other**
  - If left stationary for too long the app will ask the user if you have undertaken any physical activity in the last few hours.

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**WHAT ARE THE LIMITATIONS OF THE APP?**

While incorporating GPS enables collection of basic movement data (no locations are saved for privacy reasons, only distances travelled), stepping indoors, and therefore out of GPS signal, greatly reduces the accuracy of the tracking. Indoors the app will only be able to guess at your movements using a combination of accelerometers built into the device and rough positioning based on phone signal. The tracking is also reliant on battery life of the phone of
course, checking GPS locations regularly will drain the battery and if the phone isn’t on then it can’t track you. Also, the app relies on people always having their phone on them, something that not everyone does.

**FURTHER DEVELOPMENTS**

This app has great potential for further progression. Recommendations for future progress include the following:

1. Implementation of a data store service.

In order to save the data that the app is able to collect it is recommended that a server be set up and maintained for data storage and retrieval.

2. Development of a power save mechanism for the location tracking service

To have location tracking enabled the app utilises the smartphone’s GPS capability. This can be a drain on the battery, and so to rectify this the inclusion of a timed GPS accessing mechanism within the app is recommended.

3. Inclusion of an app-specific Heart Monitoring function

Currently, this app uses an external third-party application to monitor the participant’s heart rate. In order for this app to record and save user’s heart rate information the development of a heart rate monitor within this app is recommended.

4. Development of the app for multi-platform use

This app currently runs on android only devices. Further users could be included if the app was developed for alternative devices, such as iPhones.

5. Development of Accessibility Options

As discussed above, provision has been made for the user to manipulate settings to maximise the accessibility of the app, however this provision needs to be developed further in order for it to be useable.

6. Development of ‘Elf’ feedback system

Currently the Elf will only respond to changes in physical activity by changing between unhealthy, more healthy or fit. This could be developed further to respond to the smoking and alcohol sections of the questions. If excessive smoking or drinking is noted through these questions the Elf’s progress to the ‘fit’ state could be slowed, or even reversed taking the user backwards through the states.
7. Development of activity tracking

Further development of the activity tracking could enable the app to be able to track sleep patterns. This would help further automate data gathering and reducing the amount of input required from the user.

8. Development of diet tracking

Large, open-source databases exist of product barcodes and their associated information. Further development could see the app having the functionality to access these databases. It would allow the user to scan their food item using the phone’s camera and have the nutritional information saved for them. This eliminates the need for the user to understand correct portion sizes, the app can advise them accordingly.