Reducing Addiction to Social Media

Luke Jones
B.Sc Computer Science

March 2020

Abstract

Social media addiction is a relatively new problem, and with growing adoption rates with services such as Facebook, it seems as if it is a problem that will only become more prevalent in the years to come.

In this paper, we will be looking at the different ways one can identify social media addiction, and applying these components to a Java application designed at lowering the excessive use of social media. This project builds on research conducted by others and applies Griffiths's six component model of biopsychosocial addiction classification to a computer application in order to provide a solution to effectively combating social media addiction. This paper then evaluates this program solution using a small user study with university students. The study concludes that the proposed application could be used to effect in the real world, and that by taking this proposed solution further, social media addiction rates could be lowered.

0.1 Declaration

I certify that the material contained in this dissertation is my own work and does not contain unreferenced or unacknowledged material. I also warrant that the above statement applies to the implementation of the project and all associated documentation. Regarding the electronically submitted work, I consent to this being stored electronically and copied for assessment purposes, including the School's use of plagiarism detection systems in order to check the integrity of assessed work. I agree to my dissertation being placed in the public domain, with my name explicitly included as the author of the work.
Name: Luke Jones
Date: March 2020

Contents

Chapter 1

Introduction

1.1 Chapter Overview

This chapter will be looking into the purpose of the research project, and exploring the different motivators that brought it to light. The chapter then moves on to outline the aims and objectives of the project, these will be used at the end as an evaluation tool for the project as a whole. A report outline is then formed, describing each chapter of the report.

1.2 Research Motivation

Since the widespread adoption of the internet throughout the late 90's and early 2000's, social media platforms have been a common place for communication between individuals. Services such as Myspace and AOL instant messenger could now allow for users to share text and images with one another at an unprecedented rate [18]. As a new frontier, the design of these services would take many years before finding its groove. The Cambridge dictionary defines social media as "Websites and computer programs that allow people to communicate and share information on the internet using a computer or mobile phone" [5].

Facebook, now one of most popular social media services in the world, has been known to apply many different design patterns to keep users in, 'trapping' them. These designs are often referred to as 'dark patterns' in UX terms, where they are used to convince the user to carry out certain tasks without being fully aware of their actions [13]. With many social media services now being designed to be addictive, some are questioning the possible unforeseen consequences of this relatively undiscovered and unregulated medium of communication. The emotional and psychological impacts that these systems may be causing are only now being studied, with many reputable news sources comparing social media to other extreme addictions [17].

With Facebook reporting over 2.50 Billion active users in the December 2019 and an annual 8% user increase year after year there is room to be weary of our quick embrace of this new world [16]. Just like the adoption of cigarettes in the throughout the early 20th century, the consumers were reassured by the manufacturer that there were no negative health impacts of their new product

[19]. We see this similarly today with large social media companies assuring that their main focus is to "make the world more open and connected" when in reality these are companies who's real main objective is to make money [21].

The main motivation of this research was based off of personal experiences of the researcher in the past, dealing with addiction-like symptoms relating to using YouTube and Facebook for hours on end. After conducting some research, it was realised that many people encounter very similar situations on a daily basis. There have been studies done towards this and there has been a growing amount of evidence that shows that this so-called 'social media addiction' is an evolving problem [22].

1.3 Aims

Aims were set out at the start of the project to help guide development and make sure work is concise to set goals. These aims were later checked to evaluate the success of the software solution implemented. The following are some of the key aims:

- To develop an application that is capable of monitoring user time spent on social media.
- Design an application that will use HCI design to combat the outlined addictive features of certain social media services.
- Implement a system that will reduce social media exposure over time in an attempt to lower the user's tolerance.
- Allow the user to choose their own diet depending on how severe they feel their addiction is.

1.4 Report Outline

- **Chapter 1 Introduction:** Where the report topic is introduced and the motivations for a social media diet desktop application are described.
- **Chapter 2 Background and Research:** Finding previous studies and solutions towards the topic of social media addiction, identifying the symptoms and factors of social media addiction and how it can be related to other medical addictions.
- **Chapter 3 Design:** Outlining the core features a software solution would need to include in order to approach the outlined symptoms of social media addiction from a dietary perspective.
- **Chapter 4 Implementation:** Different implementation features are covered and the best are chosen to be used in the final solution. Images are used to demonstrate the UX design choices.
- **Chapter 5 Testing and Evaluation:** Testing the program to see if it is capable of performing tasks shown in design and that it can achieve what was first set out. User study conducted to see how a test sample react to using the program. Any possible issues outlined and solutions proposed.

- **Chapter 6 User Guide:** A step-by-step walkthrough on how the program runs and what the user experience looks like.
- **Chapter 7 Conclusions:** Review the initial aim of the report, discuss the possible next steps to the program and any afterthoughts.

1.5 Chapter Summary

This chapter went through the motivation behind this project, explaining that there is a growing need to regulate our time spent on social media, and that as many social media services are new, they are relatively unregulated. The chapter then outlines the different aims of the project, one of the main points being developing an application that is capable of monitoring user time spent on social media. After outlining and briefly describing the objectives of the report, the chapter concludes with a report outline.

The coming chapter will be looking into the negative impacts of excessive social media usage, and how the symptoms of social media addiction could possibly be categorised .

Chapter 2

Background and Research

2.1 Chapter Overview

This chapter starts out by looking at the possible negative aspects of social media usage, it then outlines how excessive use could be damaging. Next, the chapter focuses on Griffiths's components of addiction, the chapter then goes on further with studies which apply these components towards social media addiction. Finally, the chapter evaluates current popular software solutions.

2.2 Finding the Issues with Social Media Addiction

There have been many different studies looking into the possible negative impacts of social media services such as Facebook and Instagram. This section will be focusing on the different causes and impacts.

2.2.1 Dark Patterns

It has been well documented by many experts that several social media services, such as Facebook and Instagram, have implemented so-called 'dark patterns' in their user interfaces. Harry Brignull, a user research specialist on dark patterns, and founder of the website darkpatterns.org defines them as "tricks used in websites and apps that make you do things that you didn't mean to, like buying or signing up for something.". One of the easily applicable and heavily focused patterns is to do with almost all social media services, the infinite scroll. By continuously loading articles as the user scrolls down, it gives the illusion that there is an infinite scroll, this is used to keep the user in to the app. By avoiding any breakpoints in the immersive experience, users have been shown to stay in longer when using infinite scroll as opposed to pagination (standard page seperation). [2]

UX design website JustInMind proposes 4 main alternatives towards the infinite scroll [1]:

- **Sub-category grid:** This is where we move content into categories showed across a rectangular grid. Helps the user narrow down their search, good for shopping websites.

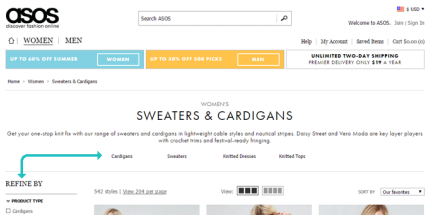


Figure 2.1: Example of a Sub-category Grid [1]

- **Pagination:** Splitting content (back) into different pages, this is good as it shows the user where they've been and how far they've come. This can be used to help the user monitor their browsing amount.

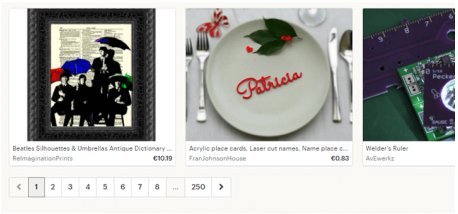


Figure 2.2: Example of Pagination [1]

- **Modal slideshow:** Using images and letting the user slide through each, good for quick news articles.

Figure 2.3: Example of a Modal Slideshow [6]

- **"Load more":** Showing the user a set number of results per page and lets the user select if they want to see more. This gives the user more control over whether or not they want to continue browsing.

Figure 2.4: Example of a Load More Feature [1]

2.2.2 Mental Repercussions

Emotional Contagion

A highly controversial study conducted by Facebook in 2012 randomly altered the news feeds of over 680,000 users. The aim of the study was around social contagion, the idea that the moods of information one receives will alter their own emotions. The study filtered user news feeds to give them only negative or positive posts, and then monitored the posts written by each user to check if their outlook has changed. The posts of the users were checked to see if they contained words matching to two lists created by Facebook of positive words and negative words. A percentage of positivity was then The study concluded that moods were in fact contagious, where when seeing mainly positive posts, a user is more likely to reproduce positivity in their own personal posts, and same for negative moods [9].

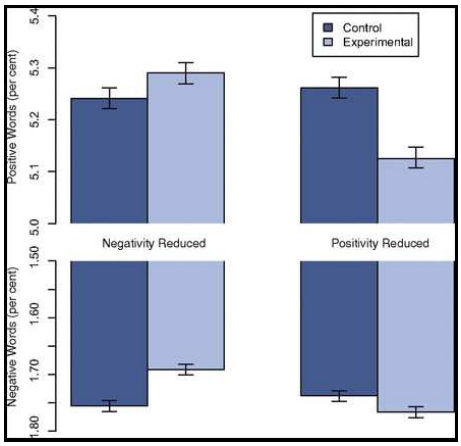


Figure 2.5: Mean values compared between experiment participants and control [14]

This study demonstrates that social media services such as Facebook have the ability to influence the mental state of a user, potentially in a negative light. This could be a big problem for people with existing mental instability such as depression.

Fear of Missing Out

One heavily discussed social impact of the increased use of social media is often referred to as the Fear of Mission Out (or FoMO for short). FoMO is the desire for one to stay constantly connected to those around them in fear that others are having rewarding experiences when one is absent. Przybylski et al conducted a literature review and a series of interviews to see what components fuel the fear of missing out. Young adult university students were gathered and asked questions about their social media usage in daily life and their actions were measured the Fear of Missing Out scale, made from the research gathered in the earlier part of the study. The study concluded that people who showed symptoms of FoMO were involved with using Facebook across several daily activities far more than those who weren't classified to have FoMO. These activities include attending university lectures, and driving [20].

2.3 Griffiths's Components of Addiction

Mark Griffiths is a psychologist and head of the international gaming research unit at Nottingham Trent University. In 2005, he released a paper arguing that all addictions are a part of a biopsychosocial process where every behaviour shares common addictive traits that can be measured and compared. Griffiths identified six components of this new framework for identifying addiction in behaviour. These six components are:

2.3.1 Salience

Griffiths identifies salience as "when the particular activity becomes the most important activity in the person's life and dominates their thinking (preoccupations and cognitive distortions), feelings (cravings) and behaviour (deterioration of socialized behaviour)". Often described with activities such as gambling or video games, this is when a person can only think about a certain activity. For tasks like smoking (and in our case, social media browsing) that can be done concurrently alongside other things, Griffiths states that there is a reverse reaction where one's mind is completely preoccupied with thoughts of doing the task while they are not able to do it. An example Griffiths uses here is to do with a smoker taking a long haul flight and having cigarettes as the single most important thing on their mind.

2.3.2 Mood Modification

This refers to when an addict will use an addictive task a consistent way to shift their current mood state, often in use as a coping strategy. We often see this with drug or cigarette use, where a person tends to smoke when stressed or sad in order to make themselves happier. Griffiths describes this feeling as "an arousing 'buzz' or a 'high' or paradoxically a tranquilizing and/or de-stressing feel of 'escape' or 'numbing'".

2.3.3 Tolerance

This is when there is an increasing amount of a certain behaviour needed to satisfy one's self or receive mood-modifying effects. This is often described as a reduced rush from the same doses of a certain task. As it may be clear, tolerance is already well researched in drug and substance addictions today. Griffiths (1993) demonstrated that gambling could be used as an example of tolerance, where non-gamblers and gamblers were placed in stressful gambling situations and had their heart rates compared to show that gamblers had far lower heart rates in almost all scenarios. [10].

2.3.4 Withdrawal

This component refers to general unpleasant or possibly painful mental or emotional states when a user ceases to continue their addictive activity. These types of symptoms can include nausea, 'moodiness', headaches, or sometimes even insomnia.

2.3.5 Conflict

This refers to when a user has either an interpersonal conflict with their own conscience, or external conflicts with those around them. This is when the user chooses their addictive activity without regard to the possible social or personal consequences.

2.3.6 Relapse

This component simply encompasses the idea that an addict will have a tendency to return to an activity in a constant pattern. Even in attempts to stop the addictive behaviour, one will relapse and continue doing it again.

Griffiths states that in order for an activity to be operationally classified as an addiction, it will need to meet all six components, however, he goes on to explain that "The difference between an excessive healthy enthusiasm and an addiction is that healthy enthusiasms add to life whereas addictions take away from it.", applying this to social media use, it could be taken from either perspective, that it helps people stay connected, but at the same time, distracts many from reality, and can be described as a crutch for an otherwise healthy society.[11]

2.4 Identifying the Biopsychosocial Symptoms of Social Media Addiction

In a study titled "Is Generation Y Addicted to Social Media?" Jaclyn Cabral attempts to apply Mark Griffiths's components of addiction to social media usage through a survey conducted on 313 university students. The questions in the survey consisted of various themes such as: demographics, general social media use, and personal perception of use. The survey results were compared to the original six components given by Griffiths. The findings were that three of the components were prevalent amongst the survey answers: **Tolerance, Salience, and Relapse.** Research participants also showed a degree of intrapsychic conflict, different from Griffiths's proposed interpersonal conflict. These three main components of Griffiths's addictive scale show us the true addictive features that social media can have on people [7].

2.5 Current Popular Solutions to Social Media Addiction

There are many applications already in use that address social media addiction and attempt to help combat it. Here are some examples which do things differently:

2.5.1 Flipd

Popular on Android and IOS devices, This app prevents the user from opening any other apps for a specified amount of time. On an attempt at opening something, Flipd will draw itself over the app, forcing the user to wait. The app remains open in the background, even if the user attempts to close it from the task manager. Once you start the timer, you're locked in. Often referred to as the 'nuclear option', this means that the user is forced to focus on something that isn't on their phone for however long they set.

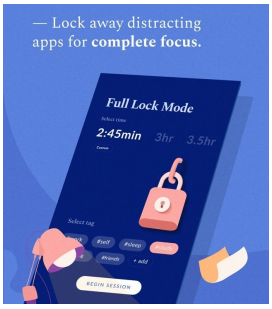


Figure 2.6: Flipd on the Apple App Store

The idea of locking the user in to zone out of the online world seems like a harsh though potentially effective method. However, in day to day use, it appears that Flipd's method of breaking a habit could end up being more of a hindrance than a help, restricting the user from accessing important apps such as email or calendar. It seems to be a good quick fix for zoning out, but it takes a rather 'shotgun' approach to this, taking out everything, good or bad [12].

2.5.2 Social Fixer

This Chrome extension allows the user to filter their Facebook feed to their specification. The user can filter out content based on author, link URL, tags, and whether or not friends have liked it. Social Fixer can also stop endless scrolling, only loading a certain amount of posts defined by the user. The extension can get rid of certain parts of the Facebook page such as the trending tab.

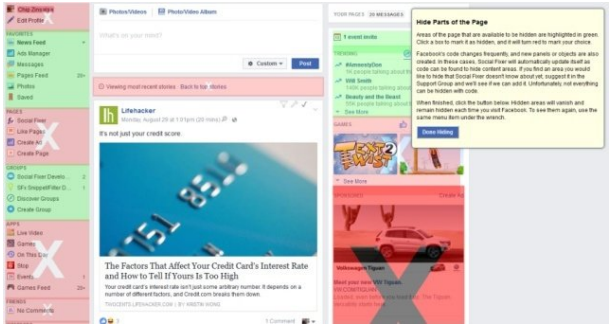


Figure 2.7: Social Fixer in Use

While this seems like a very interesting approach towards tackling the addictive qualities of social media websites by changing parts of the website design, it seems to lack any ability of lowering tolerance or stopping relapse, two of the main outlined components of addiction. For example, Social Fixer does not have any ability to time the user's progress, or to provide them with any feedback on how they are doing, it's main focus is on changing the design of the websites [4].

2.5.3 Forest

Similar to Flipd, Forest goes about keeping the user locked in throughout a timer. When the user starts a timer, the app 'plants' a virtual sapling, which will grow throughout the timer, and once

finished the user can add it to their virtual forest. However, if the user visits another app during the timer, Forest will block access, instead offering the user a "Give up" option, telling the user they will need to "kill your tree if you wish to leave" losing all growth progress if they decide to stop. This prompts the user to continue with the timer as it adds a sense of accomplishment for completing timers.

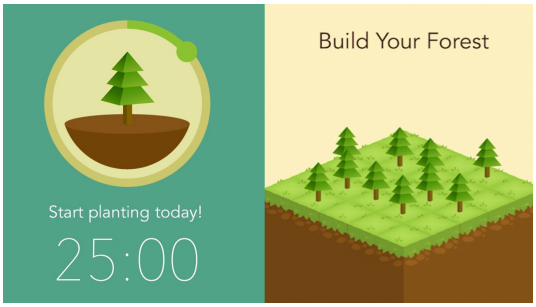


Figure 2.8: How Forest Works

One of the perceived benefits of Forest is that unlike Flipd, Forest gives the user an easy option out in case they need to access other applications on their device. Forest is very good at giving the user a sense of accomplishment and satisfaction with the forest growing aspect, this tailors towards combating the salience component of addiction outlined by Griffiths [8].

2.6 Chapter Summary

This chapter looked at the various potential issues associated with social media, it then looked into how we can identify the symptoms of these issues. The chapter then went into depth with Griffith's components of addiction, and how addiction can be developed with any activity that stimulates these components. Next, while analysing previous work, we looked at the ways we could apply Griffith's components to social media, and whether we can find an addictive correlation. By looking at a relating study, it is then found that three components correlate to social media usage: Tolerance, Salience, and Relapse. Finally, the chapter then looks at current solutions to combating these components of social media addiction, comparing and contrasting the different features of each solution.

The following chapter will be looking at creating a design that targets these three components in order to reduce the addictive nature of social media.

Chapter 3

Design

3.1 Chapter Overview

As outlined in the previous chapters, the software solution implemented here would need to target the three biopsychosocial components of Griffiths's six that were outlined in section 2.4. This chapter goes about creating a design that is functional and fits around these components. The chapter then states the functional and non-functional requirements before showing the wireframe mockups and then finally, the statechart of the system as a whole.

3.2 Designing a Program to Target Addiction

In order to help dissolve the addictive nature of social media websites, we will need to determine what program features will work best for each of the three components. By taking a biopsychosocial approach and designing a program to target these individual components, we may be able to effectively 'ween' users off of social media.

3.2.1 Lowering Tolerance

In order to attempt to lower tolerance, we would need to take a medical approach. The Drinkaware foundation explains that lowering tolerance can often be as simple as lowering the amount one is exposed to a certain substance, in our case, this would be social media [3]. In order to do this, it would be logical to give the user a set limit for the day, an allowance. This would work well at limiting and lowering the tolerance to an extent, but more should be done to further help this. The strategy chosen for the program was one of lowering the daily allowance week over week, lowering the daily allowance over the course of a month to a comparatively small amount from what they started with. This 'diet' style feature should be effective at lowering the user's need for social media.

3.2.2 Exposing Salience

Salience in our case, would be where someone finds them spending all their free thought time occupied with social media usage. The easiest way to target this component would be to make the user aware of their actions when visiting social media websites, this could perhaps be done with an

interface that shows up alongside when they access social media, which could contain a counting clock or maybe a visual aid such as a stopwatch or draining progress bar.

3.2.3 Preventing Relapse

Relapse, where the user is likely to go back to their addictive behaviour, is combated by the fundamental design of the program. By allowing the user to have access to social media, they are still given what they desire but in a controlled amount. This way, they are less likely to stop using the program altogether. If the program was just blocking social media access, like some other solutions, the user would likely be more tempted (especially at the start of their diet) to use social media from other sources and effectively relapse. By giving them what they want, we are lowering the chances of them getting their social media 'fix' from elsewhere. In order to make sure the user stays with the program, we could incorporate a difficulty selection, letting the user choose a diet depending on how much social media they would feel they need in a day.

3.3 Functional and Non-functional Requirements

Before creating the design of the program, functional and non-functional requirements were outlined in order to be used as way points to guide the design process. These requirements will also be used after the implementation to test the features of the program. The following lists are the functional and non-functional requirements for the program:

3.3.1 Functional Requirements

ID	Description
1	The program shall record the current web page the user is viewing.
1.1	The program shall compare the current visited web page with a list of blacklisted URLs.
1.2	The blacklist shall be a list of common social media websites.
2	The program shall allow the user to visit blacklisted websites in order to combat the need of relapse.
3	The program shall allow the user to choose a diet difficulty.
3.1	The difficulty of the program shall determine the amount of time the user is allowed to use each day.
4	The program shall use a timer whenever the user visits a blacklisted URL.
4.1	Upon reaching 00:00, the timer shall stop and display to the user that their daily allowance is up.
4.2	The timer shall count down from a maximum time.
4.3	The timer shall be influenced by the chosen difficulty of the diet.

Figure 3.1: Functional Requirements

5	The program shall have a visual aid to help show the user how much time they have left and to aid in preventing salience.
5.1	The visual aid shall use colours to be more intuitive.
5.2	The visual aid shall work alongside the timer and count down to empty.
6	The program shall allow the user to reset their diet at any time.
7	The program shall keep track of the user's progress, allowing them to continue after closing the program.
7.1	The program shall keep track of the user's current daily allowance.
7.2	The program shall keep track of the days and weeks past since the user started the diet.
8	The program shall reset the user's daily allowance at the end of every day.
8.1	The daily allowance shall be reduced depending on the amount of days past since the initialisation of the diet to help reduce the user's tolerance.
9	The program shall allow for multiple users to use the program.

Figure 3.2: Functional Requirements Continued

3.3.2 Non-functional Requirements

ID	Description
1	The program shall have a failure rate of no more than 5%.
2	The program shall have a maximum of 2 user clicks from program initialisation to the main process.
3	The program shall count down to 00:00.
4	The program shall have 3 difficulty settings.
4.1	The easy diet shall give the user 30 minutes a day.
4.2	The medium diet shall give the user 20 minutes a day.
4.3	The hard diet shall give the user 10 minutes a day.
5	The visual aid shall use a percentage display that counts down from 100% to 0%.
6	The program shall save to a .txt file.
7	The program shall reduce the user's daily social media usage by at least 50% by the end of two weeks.

Figure 3.3: Non-functional Requirements

3.4 Designing the User Interface

As discovered in the earlier chapter, we would need to implement a UI design which focuses on the three components outlined above. It was decided that the best way to do this would be a combination of a large countdown timer and a battery bar that changes colour depending on it's percentage. A battery bar style was decided upon as it is more visually stimulating and is a familiar concept to most social media users. The application was designed to be a companion window to a web browser, this would maintain that the user can view the window at all times and be reminded of their social media use more often.

3.4.1 Usability Principles

To ensure the program was intuitive and responsive, the user interface was designed to fit with certain HCI design principles. Therefore, different aspects of the program were designed to fit with Nielsen's 10 design heuristics [15].

- **Visibility of system status**
  The system is designed to make sure the user is aware of when their diet allowance is being counted down and when it is not, this will be done by having a simple countdown text timer.
- **Match between system and the real world**
  By 'dumbing down' the language into easy, medium, and hard difficulties, the program design is easier to pickup and understand by most common users.
- **User control and freedom**
  By allowing the user to reset their diet at any time, the program avoids making the user feel trapped or frustrated.
- **Consistency and standards**
  By keeping language consistent, the application will be easier to use as all the buttons are clear in their actions.
- **Error prevention**
  By making sure errors are caught with try catches, this will make sure that the program will stay running even when something goes wrong.
- **Recognition rather than recall**
  The program will keep most of the options on the screen when the user needs to press them, and it will keep the time and visual aid on the screen at all times to make sure the user never has to do any guess work.
- **Flexibility and efficiency of use**
  The program should be fast and easy to use for both novice and experienced users.
- **Aesthetic and minimalist design**
  The program will use few words to explain buttons, and the simple window layout means it will be hard to get lost.

- **Help users recognise, diagnose, and recover from errors.**
  The try catches mentioned earlier can be adapted to explain errors in English to the user, giving tips on how to solve a problem.

- **Help and documentation**
  This report will contain a user guide which could be used by first time users of the program.

These simple but important key design principles will not only help make the program more usable, but also help with the program's main goal of reducing the addictive nature of social media usage. By having a more visible system, the system will be lowering salience in the user by making them more conscious of their actions. With more user freedom comes less of a feeling of suppression and therefore less of a chance for relapse.

3.4.2 Wireframe Mock-ups

When the user runs the program for the first time, they will be met with two windows, the web browser, and the Social Diet window. Figure 3.4 below shows what this looks like while idle.

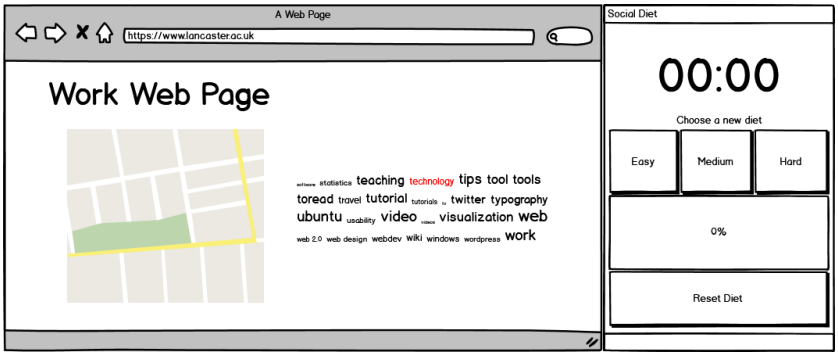


Figure 3.4: Starting up the Program

After choosing the difficulty, the interface will change and the progress bar and countdown timer will be occupied with the user selection, we can see this in Figure 3.5.

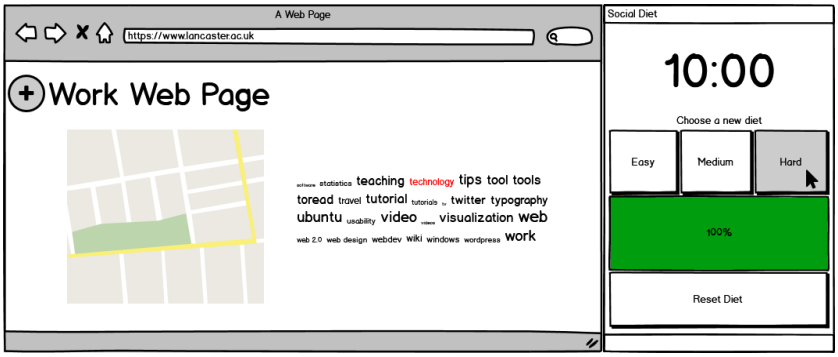


Figure 3.5: Choosing the Diet Difficulty

After diet selection, the program will wait until a blacklisted page is visited, when this happens, the diet will begin. Figure 3.6 shows how the interface changes during the diet countdown, removing unnecessary buttons during use.

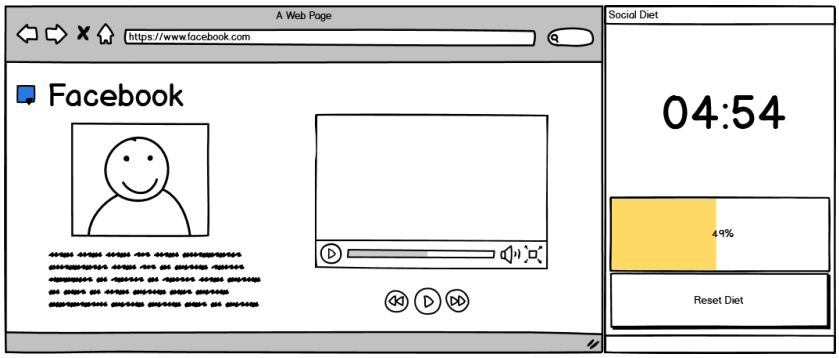


Figure 3.6: Counting Down

When the daily allowance time is up, Figure 3.7 shows how the program displays the progress bar as red to help notify this.

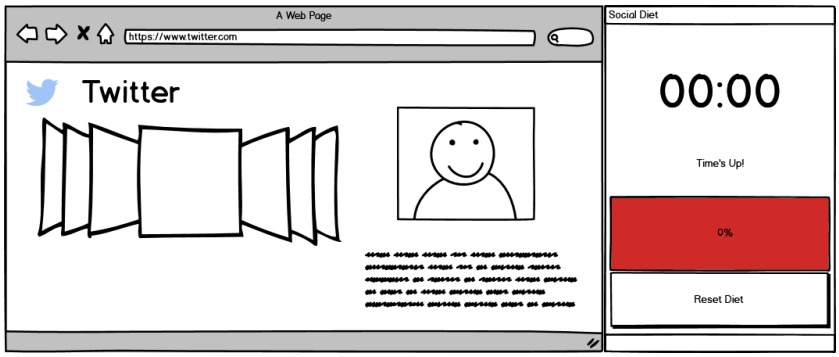


Figure 3.7: The Daily Allowance has Been Exceeded

3.5 State Chart of the Program

A state chart diagram was constructed to show the various states of the program and how it works on a fundamental level. We can see in figure 3.8 below that the plan is when the program is run, it will open a browser window and also the java program, and that these two function concurrently.

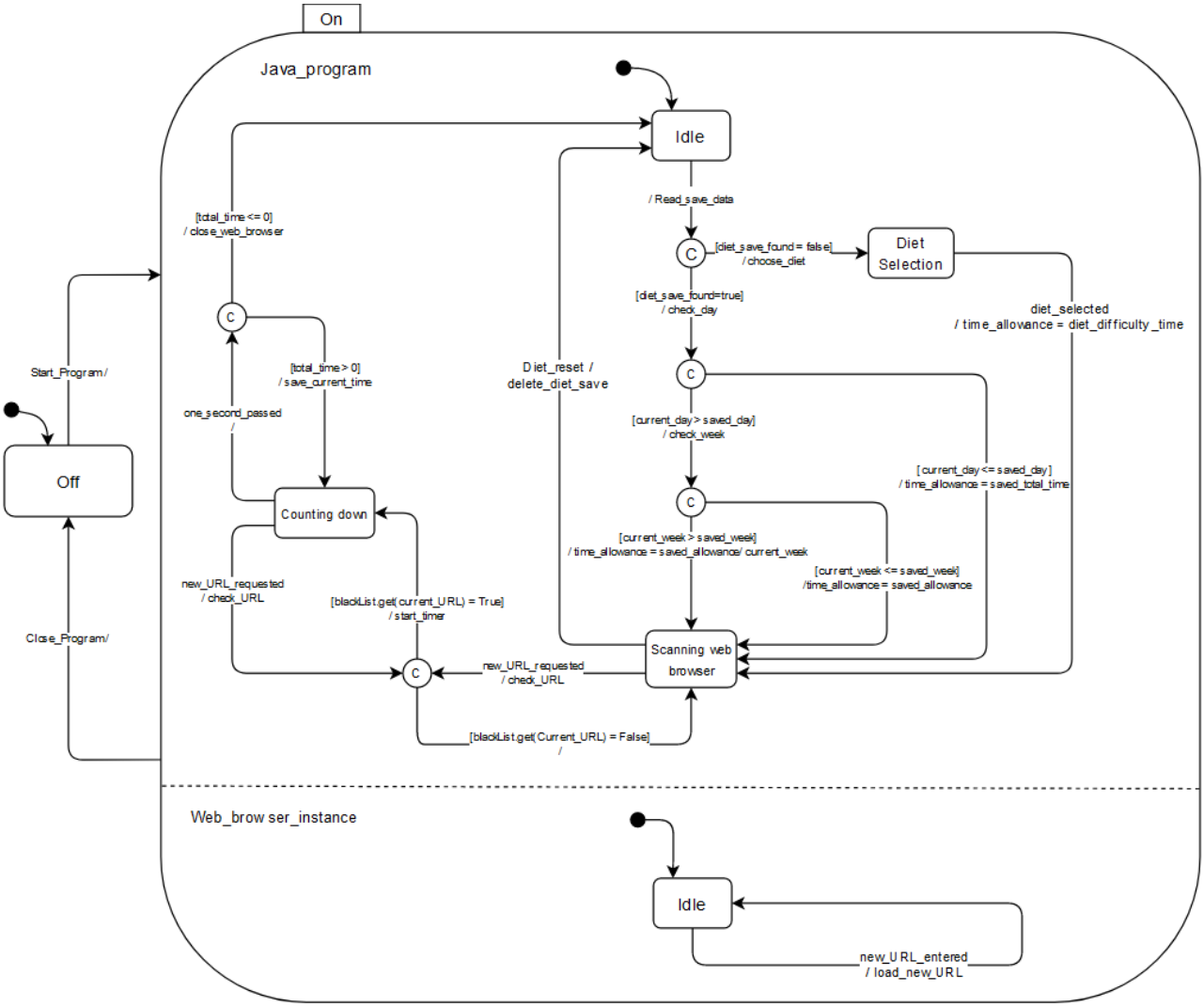


Figure 3.8: Operational State chart

Figure 3.8 shows how when the program is first started, the Java program will run the idle state. Next, the program will read the save data and check if there is a pre-existing save, if there is, the program will calculate what the current date is compared to when the diet was started, reducing the overall diet time if needed. The program also checks to see if it is still the same day, if it is then the allowance is set to the previous progress. After this, the program state is currently scanning the web browser, it will do this and check every new URL request and match them against a blacklist of social media websites. When a blacklisted URL is found, the program will move to the counting down state where seconds are counted down and progress is saved every second. This is done until the user leaves the blacklisted URL or until the allowance runs out, at which point the browser window is ordered to be closed.

3.6 UML Object-Oriented Class Diagram

Figure 3.9 below shows a more detailed overview of the functions of each proposed class. Here, Home will act as the main interface for the user, where Reader will be doing the saving and reading from a file. And Calendar will be used to calculate the current date. In good coding etiquette, the program has the Main method in a separate class.

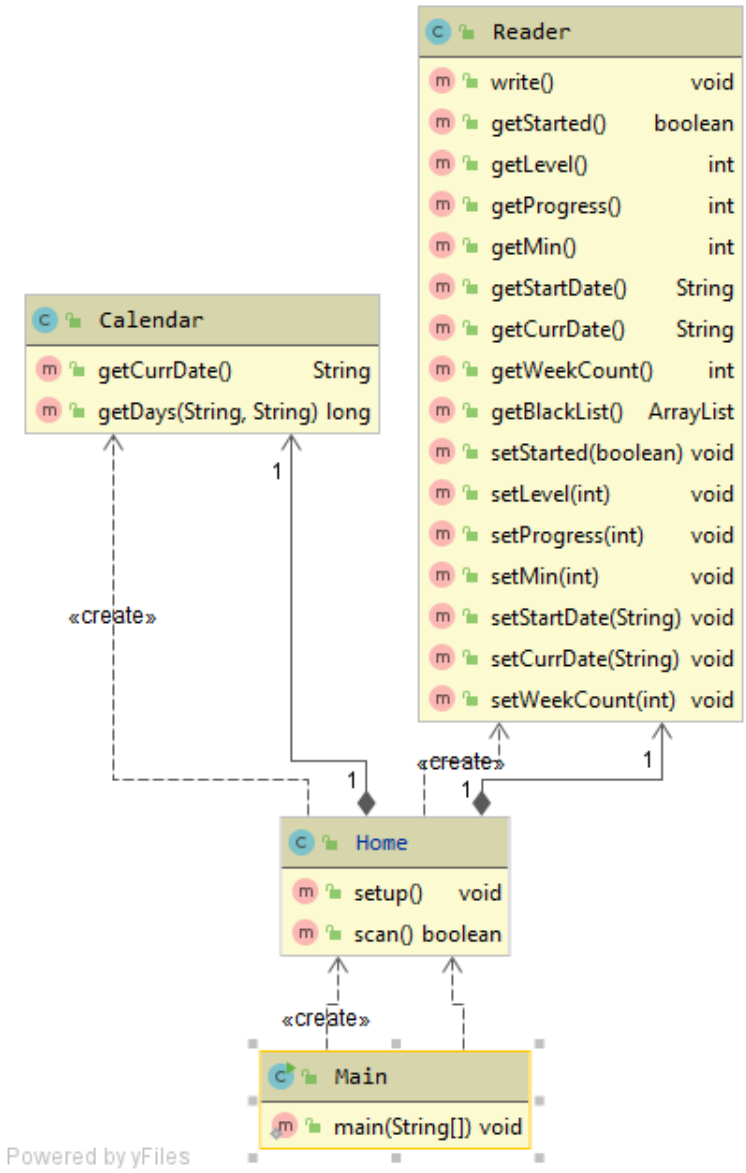


Figure 3.9: Declaring a New Instance of WebDriver as a FirefoxDriver

3.7 Chapter Summary

This chapter started off by pointing out the key program design features needed to target the three Griffiths components associated with social media addiction : Tolerance, Salience, and Relapse. The chapter then went on to explain that the best choice in design would be to have a companion window solution which is open alongside the browser and reminds the user of their actions constantly. In order to lower tolerance, the chapter explains that the program will need to be able to lower the daily total allowance of the user over time, which would require a save system. Next, the chapter goes to show a list of functional and non-functional requirements for the final solution. Wireframe mockups which are designed to fit with HCI design principles are then created, and finally a state chart of the final solution is presented, showing the working states of the final program design.

In the next chapter, the implementation of the program will be described, code and functional explanations will take place, and the reasoning behind certain decisions will be explained.

Chapter 4

Implementation

4.1 Chapter Overview

This chapter goes over the various major elements of the Social Diet program, explaining with the help of various code snippets and screenshots. The chapter covers how the program is able to record the user activity on the web browser, and how the timer is created. The chapter then goes on to discuss how the user is able to choose their diet difficulty, and then how the program works with saving it's progress. Finally, this chapter explains how the program was able to reduce the diet time over time.

4.2 Creating a Web Browser Instance in Java

Java was decided upon as a key candidate for this project due to it's overall versatility and the researcher's knowledge around it. There were several different ways that were attempted in order to record when the user was accessing social media websites.

4.2.1 Checking if a Browser Instance is Open in the Task List

One of the first attempts at this was done in Java by checking the windows task list and checking for a web browser instance. You can see in the following java code snippet (Figure 4.1) how this was attempted:

```
public boolean start (String name) throws IOException {

    String line;
    String pidInfo ="";

    Process p = Runtime.getRuntime().exec( command: System.getenv( name: "windir") +"\\system32\\"+"tasklist.exe");

    BufferedReader input =  new BufferedReader(new InputStreamReader(p.getInputStream()));

    while ((line = input.readLine()) != null) {
        pidInfo+=line;
    }

    input.close();

    return pidInfo.contains(name);


}
```

Figure 4.1: Checking the Windows Task List

However, this method proved unsuccessful at being able to read what URLs and web pages the user was visiting, a more robust method was needed to record the user's activities.

4.2.2 Selenium Web Driver

Selenium web driver was decided upon for it's browser monitoring capabilities, as well as the fact that it can open and close it's own instance of a browser for the user to use. Selenium allows for the creation of a browser window, for this project, Firefox was decided upon. In order to set up Selenium in Java so that it can create a Firefox browser window, Mozilla's Gecko web driver needed locating in the system. The following Figure 4.2 shows the code that is used to locate the Gecko web driver:

```
System.setProperty("webdriver.gecko.driver","C:\\geckodriver.exe");
```

Figure 4.2: Locating Gecko Web Driver

Next, in order to open the Selenium browser window, a new WebDriver class instance was made, named "driver". The window is opened in when the constructor of WebDriver is called. After this, the user will be met with a blank Firefox window, we can see this in Figure 4.3.

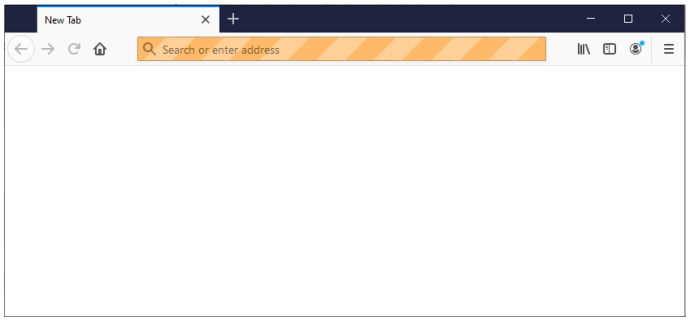


Figure 4.3: After Creating a New WebDriver Instance

The advantage of using a Firefox window is that Firefox gives the user some advantages like being able to save user passwords and a more streamlined experience. Firefox also has better support with websites using plugins and cookies.

4.3 Scanning the Current URL

After creating the WebDriver instance, reading the current URL is quite simple thanks to Selenium. Figure 4.4 shows how simple it is to get the String value "currentUrl" from driver.

```
currentUrl = driver.getCurrentUrl();
```

Figure 4.4: Obtaining the Current URL With Selenium

After obtaining the current URL, the program then needs to check if it is contained in a blacklist of social media website URLs. This list is stored in the save .txt file which we will go further in depth with later on in this chapter. The Reader class shown in the design section provides us with a String ArrayList named "blackList", this blackList contains all the websites which the program shall count as social media websites. The scan() method below (Figure 4.5) compares this list to the currentUrl variable and returns true of false depending on whether the current URL matches one from the blacklist.

```
public boolean scan(){

    try {
        currentUrl = driver.getCurrentUrl();
    } catch (NoSuchWindowException e){
        driver.quit();
        System.out.println("Session Ended");
        throw(e);

    } catch(WebDriverException e){
        System.out.println("WebDriver Exception");
        throw(e);

    }

    for (String s : blackList) {
        if (currentUrl.contains(s)) {
            return true;
        }
    }
    return false;
}
```

Figure 4.5: The Scan Method

If the scan method returns true, the program then knows that the user is accessing a blacklisted site, and will start the timer.

4.4 Timing the User

Now that the program is able to identify when the current URL is a blacklisted one, it needs to be able to time how long the user is viewing the specific website. In order to achieve this, the program would need to have a way to count individual seconds past and then minutes past. In the program, there is first an infinite loop, and within that loop there is another while loop that runs while scan() returns a boolean true, an example of how this works can be seen in Figure 4.6.

```
startTime = System.nanoTime();

while (scan()) {
```

Figure 4.6: While Scan Loop

"startTime" declared above the while loop in Figure 4.6 is used to record the time the countdown starts, it is referred to within the loop to check how much time has elapsed. The while loop keeps on checking the time compared to startTime by performing startTime - current time. This however, only counts upwards instead of counting down, so in order to re-calculate this and display it for the user, we need to do:

```
if(seconds>49){
    displaySec = "0" + (59-seconds);
}else{
    displaySec = Integer.toString( i: 59-seconds);
}
```

Figure 4.7: Changing the Countdown Display

Figure 4.7 also shows how the program checks if there is a need to display a '0' in front of the number to keep up with the format of '00:00'. After 60 seconds have passed (or one minute) the program needs to have a way to count the minutes down. Minutes here are stored as a separate counter from seconds, and when the seconds reach 60, a minute is reduced from the total set at the start. The total minutes are dependent on the diet difficulty set by the user at the beginning of the diet.

4.5 Diet Choice

As decided in the design chapter, the program allows for three choices of diet, easy, medium, and hard. It was calculated that the easy difficulty would allow for 30 minutes of social media a day, medium would allow for 20, and hard only 10. These choices would be made when the user first starts up the program and would be displayed in the GUI. The difficulty buttons, along with the entire interface, were made using the Java Swing package. Once a button is pressed, a difficulty is set. When the user visits a blacklisted site, the diet officially starts, this hides all the difficulty buttons, replacing the bottom one with the "Reset Diet" button.

Figure 4.8: Choosing the Diet Difficulty

4.6 Saving Current Progress

Saving is important for the Social Diet program as it needs to remember the user's progress in order to reduce daily allowance over time. It is also important if the user closes and re-opens the application throughout the day. The program uses a .txt file called data.txt which is read from and written to in the "Reader" class.

4.6.1 Reading and Writing to a .txt File

A .txt file was chosen as the main form of storage as it works simply for a local setup such as what the user will be doing. There are more complicated methods of storage with more features but .txt was chosen as it was sufficient as a proof of concept and the programmer was familiar in using it as a storage type from previous work.

The data.txt file contains two types of information, firstly there is the save data of the program, this includes the diet start date, the diet difficulty, the current daily allowance, and the last date accessed. This data is stored in a format of key and value, with key being on one line, and value being beneath. Lastly, the blacklist of social media websites is stored, these are stored in the format of "facebook.com" for example. The blacklist does not have any key. In order for the Reader class to read from the data.txt file, it needs to initialise an instance of the BufferedReader class, this is done with the following:

```
BufferedReader br = new BufferedReader(new FileReader(file));
```

Figure 4.9: Creating an Instance of the BufferedReader Class

After buffered reader is initialised, the program needs to start reading the first part of the file, which is the program data, this is done by reading two lines of the file at a time, assigning the first as a key, and the second as the value. These values are then added to a HashMap object called "saveData". The program then goes on to add all the blacklisted URLs to an ArrayList object called "blackList". In order to determine whether to read two lines of data.txt save file for the HashMap, or to read one at a time for the ArrayList, the program simply reads one line and checks to see if it contains ".com" in the String, if it does, then it is part of the blacklist and needs to be added to the ArrayList. We can see this process in Figure 4.10 below.

```
while ((key = br.readLine()) != null) {
    if(key.contains(".com")){
        blackList.add(key);
    }else {
        value = br.readLine();
        saveData.put(key, value);
    }
}
```

Figure 4.10: Reading the .txt File Into a HashMap and ArrayList

As the Reader class uses a HashMap to store data from the data.txt file, it can be highly extendable as HashMaps do not need a fixed size, nor require any information about what their data is, it allows the contents to be read and written to regardless of what the .txt file originally contained.

4.7 Reducing the Diet Time Progressively

Daily allowance reduction over time is one of the most important factors into making Social Diet effective at lowering tolerance in the users. In order for this to be done effectively, the program would need to have the ability to check the current date.

4.7.1 Using the LocalDate Class

The Java program used the LocalDate class to keep track of the date of diet creation, the current date, and how many days had past. In order to complete this, a new class, "Calendar" was made. Calendar would allow the Home class to calculate the current date, and the days between two dates. Figure 4.11 shows how the program retrieved the current date.

```
public String getCurrDate(){

    return LocalDate.now().toString();
}
```

Figure 4.11: Returning the Current Date as String

In order to calculate the days between two dates, a common format needed to be established. This was done with the creation of a DateTimeFormatter class instance. The following Figure 4.12 shows how this is created:

```
private DateTimeFormatter formatter = DateTimeFormatter.ofPattern("yyyy-MM-dd");
```

Figure 4.12: Creating a DateTimeFormatter

The DateTimeFormatter is important here as it creates a common format for all dates created by the Calendar class to be read into the system as "yyyy-MM-dd". A new method, "getDays()" takes two String dates, and returns a long value of the days between these dates. Figure 4.13 shows how it utilises the ChronoUnit.DAYS.between method and the previously explained DateTimeFormatter.

```
public long getDays(String first, String second){

    final LocalDate firstDate = LocalDate.parse(first, formatter);
    final LocalDate secondDate = LocalDate.parse(second, formatter);
    final long days = ChronoUnit.DAYS.between(firstDate, secondDate);
    System.out.println("Days between: " + days);
    return days;
}
```

Figure 4.13: Calculating the Days Between Two Dates

4.7.2 Lowering the Daily Allowance

After being able to tell the days between, the following Figure 4.14 shows the if statements used to determine how much to reduce the daily allowance by, and how it figures out how many days have past.

```
if((int) c.getDays(r.getCurrDate(),c.getCurrDate()) > 0){ //Past current day


    if((dietDays > 28)&&(r.getWeekCount() < 4)) { //Four weeks past

        r.setWeekCount(r.getWeekCount() + 1);
        r.setLevel((int) (r.getLevel() *0.5));

    }else if((dietDays > 21)&&(r.getWeekCount() < 3)) { //Three weeks past

        r.setWeekCount(r.getWeekCount() + 1);
        r.setLevel((int) (r.getLevel() *0.7));


    }else if((dietDays > 14)&&(r.getWeekCount() < 2)){ //Two weeks past

        r.setWeekCount(r.getWeekCount()+1);
        r.setLevel((int) (r.getLevel() *0.8));

    }else if ((dietDays > 7)&&(r.getWeekCount() < 1)){ //One week past

        r.setWeekCount(r.getWeekCount()+1);
        r.setLevel((int) (r.getLevel() *0.9));

    }

    r.setProgress(60);
    r.setMin(r.getLevel());
    r.setCurrDate(c.getCurrDate());
    r.write();

}
```

Figure 4.14: Checking How Many Weeks Have Past

As Figure 4.15 shows, the program will reduce diet time by 10% after 1 week, 20% after 2 weeks, 30% after 3 weeks, and a massive 50% after 4 weeks. This extreme drop off would be weened into after the 4 weeks of use, and depending on the difficulty chosen, can change. The following Figure 4.15 shows how these allowance changes look for each diet difficulty.

Diet Difficulty	Weeks			
	1	2	3	4
	10%	20%	30%	50%
Easy	27	21	14	7
Medium	18	14	9	4
Hard	9	7	4	2

Figure 4.15: Calculating How Much to Reduce the Allowance by

4.8 Chapter Summary

This chapter looked at various aspects of the program, and went in depth explaining the processes of each, both in non-technical terms, and with code snippets. The chapter then showed how the more complicated aspects of the program, such as creating the timer, were completed, and how UI decisions, like the difficulty buttons, were programmed to be more user friendly.

The next chapter, Testing and Evaluation, will be conducting and analysing a short user study on how the program is perceived by test participants, and will be testing the original requirements and aims of the program made in the Design chapter.

Chapter 5

Testing and Evaluation

5.1 Chapter Overview

This chapter first looks at a user study conducted on a sample group of students, after assessing the results, the chapter continues to test the program against the functional and non-functional requirements stated earlier in the design chapter.

5.2 Program Testing

With a functional program working, testing could then be conducted to determine how effective the program is at it's original purpose. A user focus group was also conducted to see how a sample of students would feel about the certain features of the program.

5.3 User Evaluation

Six participants were gathered through an opportunity sample. These participants had a mean age of 21 and were all students at Lancaster University. All participants gave informed consent and the right to withdraw at any point during the exercise (see appendices D and E). Participants were promised that their information be made anonymous. Participants took part in a short testing demo, followed by a one on one interview.

The participants were first asked some questions regarding their daily usage of social media services, and whether or not they identified themselves as addicted to social media. Next, the participants were guided through how to use the program and allowed to play around for as long as they liked, during this time, they were informed about features such as reduction over time, a feature they will not be able to get to experience due to the constraints of the sit-down study. After the demonstration of the program, participants were then given a short series of questions regarding how they found the program as a whole. These questions (see appendix B) included such things as what feature they most enjoyed and which they least enjoyed, as well as whether they would find themselves personally using the product. The results from the user study (see appendix C) were recorded and then transcribed, and clusters were identified in the results in order to find

any correlations in the participants answers. By looking at these results, the median for time spent on social media was calculated to be 2-4 hours per day.

A table showing some of the most favoured and least favoured items can be seen below in Figure 5.1. We can see here that one of the most favoured features of the program is the battery bar indicator, with the second most favoured being the choice of diet.

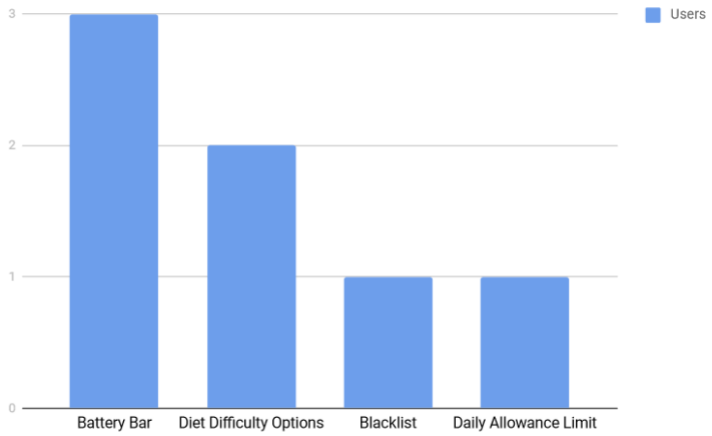


Figure 5.1: Bar Chart Showing The Most Favoured Features With Participants

After this, some new features suggested by the users include allowing the user to **change the blacklist before a diet** and also allowing the user to **customise the diet times**. There was a consensus that all users would think the program would work well at reducing tolerance, one of the key components of the Griffiths six that we outlined in chapter 2. 30% of the participants interviewed also noted the possible redundancy of the countdown timer and the battery bar, pointing out that they could be combined to simplify the user interface.

5.4 Review of Program Requirements

In this section, the original requirements of the program from the design chapter were revisited and reviewed against the existing program solution. To judge whether a requirement has been met, they are graded with one of three outcomes: Passed, Partially Passed, and Failed. This way, it can be seen how successful the program has been as a whole.

ID	Functional Requirement	Status and Comment
1	The program shall record the current web page the user is viewing.	Passed. Current URL can be accessed.
1.1	The program shall compare the current visited web page with a list of blacklisted URLs.	Passed. Current URL can be compared against the blackList ArrayList.
1.2	The blacklist shall be a list of common social media websites.	Passed. Blacklist can be added to in the .txt file in future updates.
2	The program shall allow the user to visit blacklisted websites in order to combat the need of relapse.	Passed. The user can visit blacklisted websites, the timer will start recording when they do.
3	The program shall allow the user to choose a diet difficulty.	Passed. The user can choose between easy, medium, and hard difficulties.
3.1	The difficulty of the program shall determine the amount of time the user is allowed to use each day.	Passed. The easy mode starts off allowing 30 minutes, medium 20 minutes, and hard 10 minutes.
4	The program shall use a timer whenever the user visits a blacklisted URL.	Passed. The timer will run when a blacklisted URL is detected using the scan() method.
4.1	Upon reaching 00:00, the timer shall stop and display to the user that their daily allowance is up.	Partially Passed. The program will display that the time is up but there is no way for the program to currently take priority over other windows.
4.2	The timer shall count down from a maximum time.	Passed. The daily allowance is set by the difficulty.
4.3	The timer shall be influenced by the chosen difficulty of the diet.	Passed. The maximum time is different depending on the diet difficulty.
5	The program shall have a visual aid to help show the user how much time they have left and to aid in preventing salience.	Passed. The battery-bar style display provides a visual stimulus and can help remind the user that they are using social media, lowering salience.
5.1	The visual aid shall use colours to be more intuitive.	Passed. The battery-bar style display was found to be intuitive in the user study and changes colour when it is low.
5.2	The visual aid shall work alongside the timer and count down to empty.	Passed. The battery bar displays a percentage of the timer.

Figure 5.2: Functional Requirements Test Part 1

6	The program shall allow the user to reset their diet at any time.	Passed. The reset diet button is accessible as soon as the user activates a diet.
7	The program shall keep track of the user's progress, allowing them to continue after closing the program.	Partially Passed. The program saves the user progress locally on a .txt file but does not currently support multi-device or multi-user usage.
7.1	The program shall keep track of the user's current daily allowance.	Passed. The program keeps the daily allowance in the .txt file alongside other data.
7.2	The program shall keep track of the days and weeks past since the user started the diet.	Passed. The program keeps track of days past with the getDays() method in the Calendar class. With this, the program determines how many weeks have past.
8	The program shall reset the user's daily allowance at the end of every day.	Passed. The program checks if the current opening day is the same as the last accessed day, if not, it resets the allowance.
8.1	The daily allowance shall be reduced depending on the amount of days past since the initialisation of the diet to help reduce the user's tolerance.	Partially Passed. The program reduces the daily allowance depending on how many weeks have passed up to four.
9	The program shall allow for multiple users to use the program.	Failed.

Figure 5.3: Functional Requirements Test Part 2

ID	Non-functional Requirement	Status and Comment
1	The program shall have a failure rate of no more than 5%.	Passed.
2	The program shall have a maximum of 2 user clicks from program initialisation to the main process.	Passed.
3	The program shall count down to 00:00.	Passed.
4	The program shall have 3 difficulty settings.	Passed.
4.1	The easy diet shall give the user 30 minutes a day.	Passed.

Figure 5.4: Non-functional Requirements Test Part 1

4.2	The medium diet shall give the user 20 minutes a day.	Passed.
4.3	The hard diet shall give the user 10 minutes a day.	Passed.
5	The visual aid shall use a percentage display that counts down from 100% to 0%.	Passed.
6	The program shall save to a .txt file.	Passed.
7	The program shall reduce the user's daily social media usage by at least 50% by the end of two weeks.	Failed. The program reduces the social media usage by 28% by the end of two weeks. 50% reduction is achieved after three weeks.

Figure 5.5: Non-functional Requirements Test Part 2

As it appears Figures 5.2 - 5.5 above, 28 out of the 30 original requirements resulted in a pass or partial pass, this leaves us with a pass rate of 93% for the program as a whole. There is however, scope left here for improvement, as there were several partial passes which show possible ways to improve the system in the future.

5.5 Chapter Summary

This chapter combines the results of a user study and a requirement test in order to determine how effective the program solution implemented was. It was found that the program's features could be added to and even simplified in order to improve the program.

The next chapter will be a step-by-step guide on how the program is used.

Chapter 6

User Guide

6.1 Chapter Overview

This chapter will be showing a step-by-step process on how the program is run, with the help of screenshots along the way.

6.2 Starting the Program for the First Time

When the user first opens the program for the first time, they will be greeted with two windows, an empty web browser, and the Social Diet application window. Figure 6.1 shows how this looks.

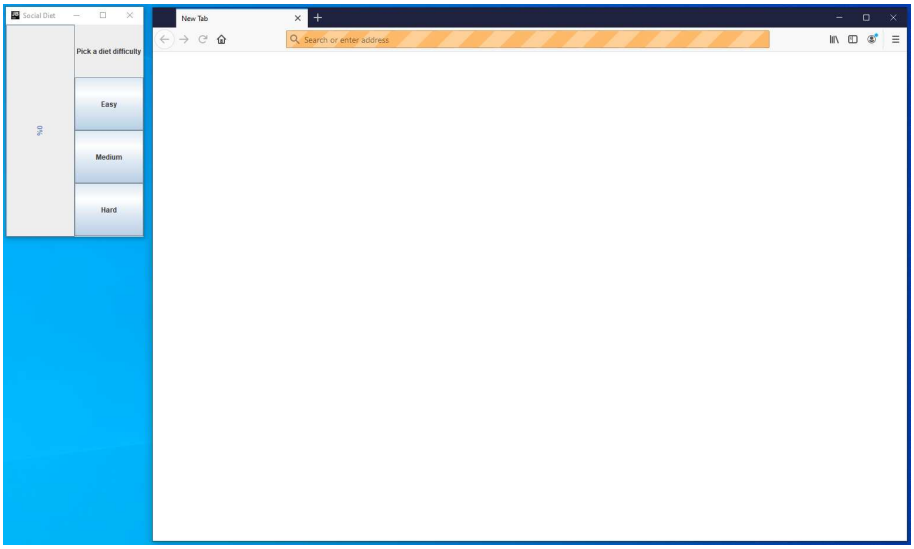


Figure 6.1: Starting the Program for the First Time

6.3 Choosing a Difficulty

The user is then prompted to choose a diet difficulty, from one of three options in the right pane. During this time, if the user visits any URL, regardless of it being social media or not, the program will do nothing. After the user selects a difficulty level, the timer and battery bar indicator will be filled to the appropriate difficulty. Figures 6.2 - 6.4 show the differences between these diets.

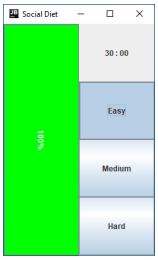


Figure 6.2: Selecting Easy Difficulty

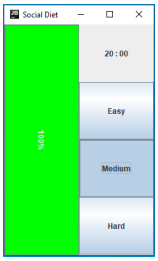


Figure 6.3: Selecting Medium Difficulty

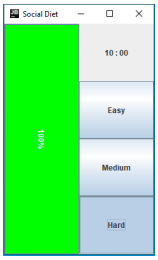


Figure 6.4: Selecting Hard Difficulty

6.4 Starting the Diet

Once a difficulty is chosen, the program is ready to be used, but the chosen has not officially been commenced yet, this only happens once the user visits a web page whose URL is featured on the blacklist of social media websites. Once this is done, the program will commence the countdown, and the difficulty options will be hidden, with the "hard" button being replaced with a "reset" button. Figure 6.5 below shows what this looks like.

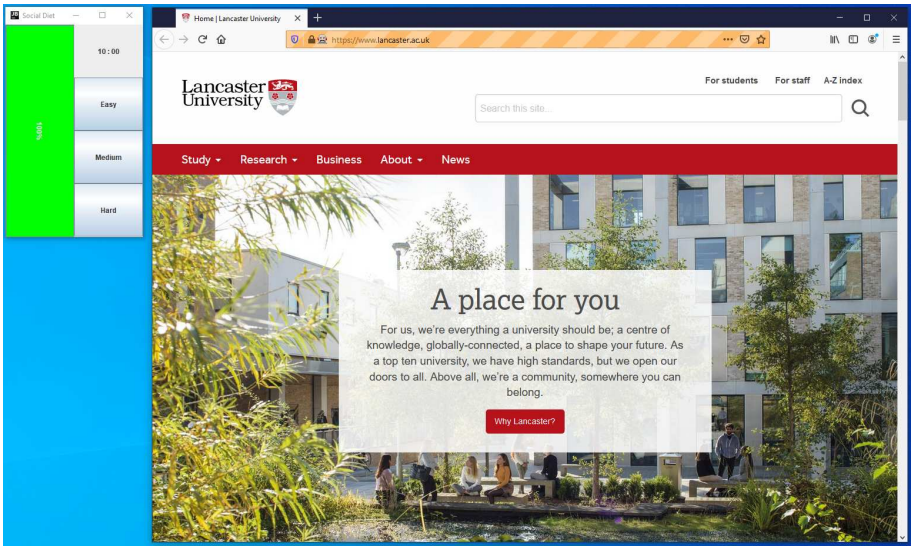


Figure 6.5: Visiting a Non-blacklisted URL

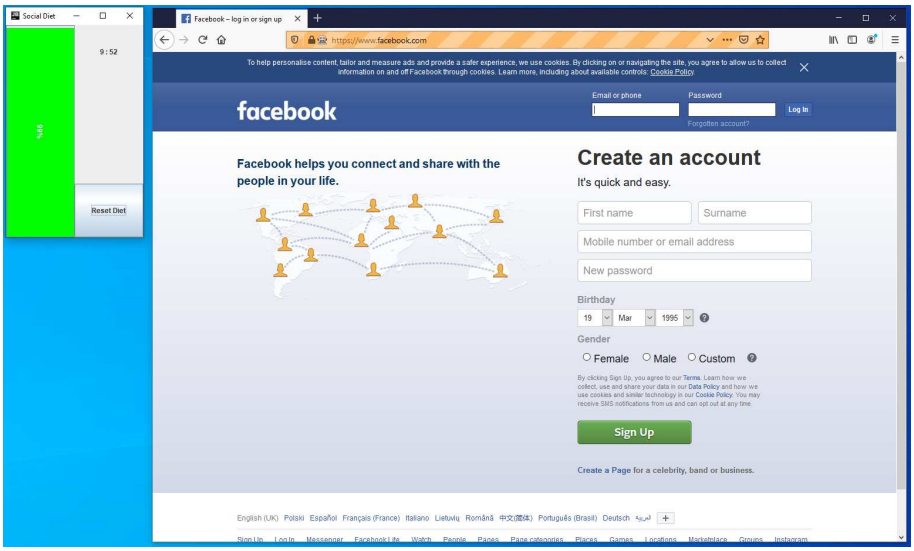


Figure 6.6: Visiting a Blacklisted URL

Once on a blacklisted social media website, if the user decides to go to a non-blacklisted URL, the countdown timer will pause. The user's progress is saved so that even if they close and re-open the program they will still be met with the same progress.

6.5 Counting Down

During the countdown, the battery bar will change colour as it decreases, going from green, to yellow, to red. This helps remind the user how much of their daily allowance they have gone through, it uses the assosiation of red being bad and green being good.

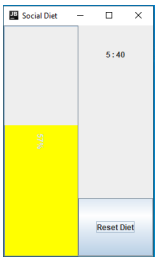


Figure 6.7: Battery Bar Turning Yellow

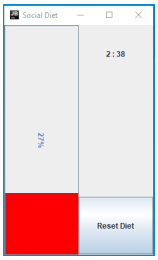


Figure 6.8: Battery Bar Turning Red

Figures 6.7 and 6.8 show how the colour changes when the battery bar reaches different percentages. When the timer reaches zero, the countdown clock changes text to say "Time's up!" and the timer stops, the program will then close the browser window if the user stays on the social media website. We can see what the time's up message looks like in Figure 6.9 below.

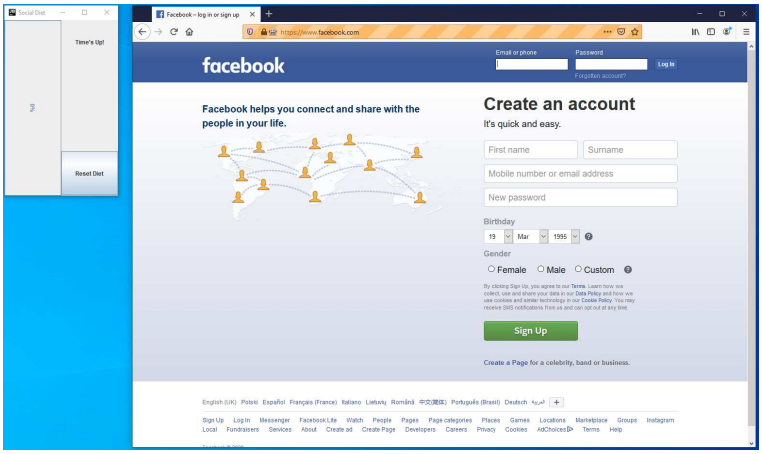


Figure 6.9: The User Has Run Out of Daily Allowance

6.6 Reduction of Allowance Over Time

The daily allowance is reduced over the course of 4 weeks. At the end of the first week, the allowance will be reduced by 10%, this can be seen in Figure 6.10.

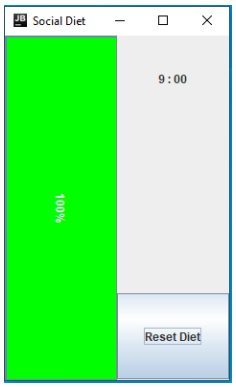


Figure 6.10: Diet Allowance Reduction After 1 Week

In Figure 6.10 we can see that the starting allowance for the day is now 9 minutes, 10% less than the original 10 minutes the hard difficulty diet starts with.

Chapter 7

Conclusions

7.1 Discussion

Although the final solution differed quite a bit from the original project proposal, all of the key aims were still met. The original project proposal was to have a phone app that was focused on recording user social media usage and reporting back as part of a larger user study. It was determined that this would not be effective at tackling the larger problem which is social media addiction so the main objective of the project was changed to be more of a programming solution than a research assignment.

7.2 Review of the Original Aims

- **To develop an application that is capable of monitoring user time spent on social media.** This aim was met successfully, the Social Diet program, while not perfect, does a good job at recording user activity across many different social media platforms.
- **Design an application that will use HCI design to combat the outlined addictive features of certain social media services.** This aim was met successfully, the HCI design principles were used in the design of the program interface in order to make sure everything was intuitive and also effective.
- **Implement a system that will reduce social media exposure over time in an attempt to lower the user's tolerance.** This aim was met successfully, the implementation of a calendar system allowed for the system to keep track of days and reduce the daily allowance time week after week.
- **Allow the user to choose their own diet depending on how severe they feel their addiction is.** This aim was met successfully, the user is able to choose diet difficulty, changing the time of their daily allowance and making the diet easier or harder for themselves.

7.3 Future Work

An easy place to start for this system would be storing user data online instead of locally, this would allow for multiple users across multiple devices, so someone could have the application working at home and then also in the office. Another potentially important part to work on in the future would be allowing for diet plans that last longer than just 4 weeks, maybe a diet plan with a more gradual decrease in time across 8 weeks could be interesting to see. The system look and feel could be improved upon quite a bit, maybe moving from java swing to something more complex could help change this and give the GUI a sleeker look. Maybe the features of the GUI could be enhanced with a small display showing more statistics such as the current diet, and current week etc. this could be done as a motivator as well.

As mentioned at the start of this section, allowing for multiple devices would be a big next step, maybe android implementation would be an interesting move, and maybe not that difficult as we are working with Java after all.

7.4 Closing Remarks

Working on this project has shown the real effect social media has on our lives, I really do believe that social media addiction is a bigger problem for most of us than we may even realise. In the next few years, applications similar to Social Diet here will become far more mainstream, as people realise how important their free time really is and how social media services are designed to dominate this. I think this project has been a success at showing how much a simple application can do in terms of reducing the addictive nature of social media, and it will be interesting to see how a similar fully fledged application may look in the near future.

Bibliography

[1] 4 ux friendly alternatives to infinite scroll. https://www.justinmind.com/blog/4-ux-friendly-alternatives-to-infinite-scroll/.

[2] Dark patterns. https://www.darkpatterns.org/.

[3] How to take a break and reset your tolerance. https://www.drinkaware.co.uk/advice/how-to-reduce-your-drinking/how-to-cut-down/how-to-take-a-break-and-reset-your-tolerance/.

[4] Social fixer for facebook. https://chrome.google.com/webstore/detail/social-fixer-for-facebook/ifmhoabcaeehkljcfclfiieohkohdgbb.

[5] Social media: meaning in the cambridge english dictionary. https://dictionary.cambridge.org/dictionary/english/social-media.

[6] Responsive slideshow modal with vanilla javascript - vshowbox. https://www.cssscript.com/responsive-slideshow-modal-vanilla-javascript-vshowbox/, Feb 2018.

[7] Cabral, J. *Is Generation Y Addicted to Social Media?* PhD thesis, The Elon Journal of Undergraduate Research in Communications, 2011.

[8] Gallucci, N. Forest is a useful app that helps you go phone-free by inspiring you to plant trees. https://mashable.com/article/forest-app-productivity-focus-review/?europe=true, May 2019.

[9] Goel, V. Facebook tinkers with users' emotions in news feed experiment, stirring outcry. *The New York Times 29* (2014).

[10] Griffiths, M. Fruit machine gambling: The importance of structural characteristics. *Journal of gambling studies 9*, 2 (1993), 101–120.

[11] Griffiths, M. A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance use 10*, 4 (2005), 191–197.

[12] Inc, F. flipd - keep focused. https://apps.apple.com/us/app/flipd-keep-focused/id1071708905.

[13] Jaiswal, A. Dark patterns in ux: how designers should be responsible for their actions, Aug 2018.

[14] Kramer, A. D. I., Guillory, J. E., and Hancock, J. T. Experimental evidence of massive-scale emotional contagion through social networks, Jun 2014.

[15] Nielsen, J. 10 heuristics for user interface design: Article by jakob nielsen.

[16] Noyes, D. Top 20 facebook statistics - updated january 2020, Jan 2020.

[17] Parkin, S. Has dopamine got us hooked on tech?, Mar 2018.

[18] Petronzio, M. A brief history of instant messaging, Oct 2012.

[19] Pierce, J. P., and Gilpin, E. A. A historical analysis of tobacco marketing and the uptake of smoking by youth in the united states: 1890–1977. *Health Psychology 14*, 6 (1995), 500.

[20] Przybylski, A. K., Murayama, K., DeHaan, C. R., and Gladwell, V. Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior 29*, 4 (2013), 1841–1848.

[21] Smithson, N. Facebook inc.'s mission statement vision statement (an analysis), Feb 2019.

[22] Van Den Eijnden, R. J., Lemmens, J. S., and Valkenburg, P. M. The social media disorder scale. *Computers in Human Behavior 61* (2016), 478–487.

Appendix A

Project Proposal

Challenging the Negative Impacts of Technology

Luke Jones

Objectives

This project aims on investigating the psychological and emotional impacts of prolonged technology use, more specifically smartphone and social media usage. This is important as we live in an interconnected society with more and more demand for the repeated use of social media and connected devices.

The main objective of this project will be to develop a piece of software capable of detecting and potentially preventing negative design patterns which can impact the user's emotional wellbeing. The second part of this project will be to measure the outcome and efficiency of this software.

Motivation

Social media is all around us, with Facebook reporting over 2.1 billion active monthly users, it seems almost completely unavoidable (Statista, 2019). Social media in its design is intended to help connect people around the world, and provide a medium for communication, and improve the standard of living for those who use it. However, it's become more evident recently that many apps and websites use tactics to hook users in and keep them active in order to benefit the website, these mental design tactics could now be linked to negatively impacting the users in the long run (BBC News, 2019).

FOMO (or Fear Of Missing Out) encompasses the feeling of anxiety when one believes others are having more rewarding experiences without them. FOMO of often highlighted as a key component to the feelings of inadequacy people report having (Edmonds, 2019).

Other issues more related to physical issues have been discovered as well, such as obesity and ergonomics issues like eye-strain. I plan to focus mainly on the emotional aspects of social media usage but if there are related ergonomic or physical issues, I may address these also.

Figure A.1: Project Proposal Part 1

Related Work

Many studies have been conducted in relation to the emotional impacts of social media. One of the most talked-about and ethically-controversial studies related to this topic is the Facebook emotional manipulation study (Kramer, 2014). This study focused on altering the facebook feeds of 689,003 users in order to discover whether seeing posts stimulating mainly positive or negative thoughts would have an outcome on the user's mental wellbeing. After changing the feeds of the participants, the researchers then measured the posts from these users to test for emotional contagion.

The results of the study show that users who had positive content reduced would post on a more negative tone in their status updates, and when negative content would be reduced, it would create an opposite effect. This study did not get informed consent of any from from any of its participants and is therefore very controversial especially as it involved subjecting the participants to negative emotional stimulus. The study does help show, however, that one's emotional state can be altered through a social media platform such as Facebook, this is important to my study.

There are several apps for Android and IOS that focus on reducing phone screen time and promote breaking the addictive nature of social media. Both Forest, and Headspace focus on keeping users away from notifications by rewarding them for time-away-from-screen. Forest helps users plant a virtual forest one tree at a time. The tree grows while the app is left on screen, if the user leaves ;^) then the tree is killed and all the user's progress lost. The app rewards the user for longer and longer periods of time spent on the app and away from other apps (Forestapp.cc, 2019).

Headspace focuses more on meditation and mental wellbeing, setting up meditation sessions to keep the user away from distractions (Headspace, 2019). Instead of just blocking the user from social media, Headspace focuses on helping balance the user's mental state and "switch off" from the outside world.

Methods

A study will be used at the beginning, a sample group of 20 participants will be set up with the application. All participants will be active daily users of some form of social media and must be using an Android phone/tablet. The research software will act as a logger and the participants will be instructed to turn it on/off when using social media, this is to avoid any possible breaching of ethics.

The appropriate ethics forms will need to be filled out beforehand, and the participants will have the right to withdraw at any time.

The keylogger will record specific things such as, time spent scrolling downwards, time spent stationary on any single point, whether the screen is on or off. The application will not save any specific websites or names from the user's device, nor will it have access to any parts of the user's device which are not required for the study.

There will be a pilot study of only 2 participants, this is to test the features and feasibility of the study. The pilot will also make sure there are no major issues with the application before sending it out for the main study.

The final application will be focused on changing the way the users can interact with social media, perhaps by removing scrolling mechanics for an alternative, more mediatory solution.

Figure A.2: Project Proposal Part 2

Workplan

- Research and Proposal - This is where the research will be conducted into previous studies and the right plan for work will be made.
- Application Design and Development - This is where the main design for the application will take place, the application will subsequently be developed after design is finished with.
- User Study - This will be to test the feasibility of the software and whether or not it can work in the real world environment.
- Tweaks to Application Design - After the study has been conducted, the final software will be adjusted to any issues found during the study.
- Main Study - This will be on a larger group of participants than the pilot study, hopefully more concise and accurate results will be obtained.
- Evaluation and Analysis - This is where measurements will be taken from the data to decide what negative design attributes are being used in popular social media, a writeup will be conducted with the data into a final report, outlining all the different aspects of the study.

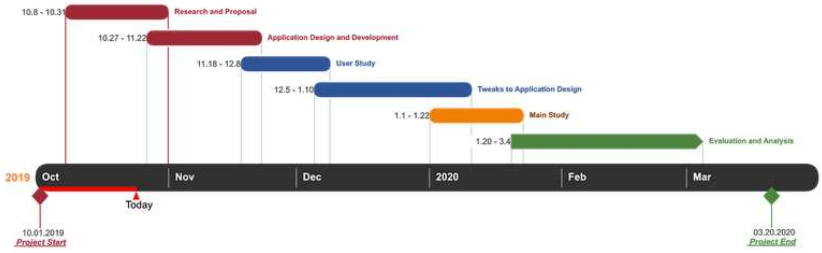


Figure A.3: Project Proposal Part 3

References

- BBC News. (2019). Social media is 'deliberately' addictive. [online] Available at: https://www.bbc.co.uk/news/technology-44640959 [Accessed 22 Oct. 2019].
- Edmonds, R. (2019). Anxiety, loneliness and Fear of Missing Out: The impact of social media on young people's mental health | Centre for Mental Health. [online] Centreformentalhealth.org.uk. Available at: https://www.centreformentalhealth.org.uk/blog/centre-mental-health-blog/anxiety-loneliness-fear-missing-out-social-media [Accessed 23 Oct. 2019].
- Statista. (2019). Facebook users worldwide 2019 | Statista. [online] Available at: https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/ [Accessed 22 Oct. 2019].
- Kramer (2014). Experimental evidence of massive-scale emotional contagion through social networks. [online] PNAS. Available at: https://www.pnas.org/content/111/24/8788 [Accessed 24 Oct. 2019].
- Forestapp.cc. (2019). *Forest*. [online] Available at: https://www.forestapp.cc/ [Accessed 24 Oct. 2019].
- Headspace. (2019). *Meditation and Sleep Made Simple - Headspace*. [online] Available at: https://www.headspace.com/ [Accessed 24 Oct. 2019].

Figure A.4: Project Proposal Part 4

Appendix B

User Study Questions

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   Less than 1 hour
   1-2 hours
   2-4 hours
   More

2. Would you say that you have an addictive relationship with social media use?

3. Do you find yourself spending more time than intended when browsing social media?

4. So would you say it often feels hard to stop?

5. Would you want to reduce this?

6. What part of the program do you most like?

7. What part of the program do you least like?

8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?

9. How often do you think you'd use this program?
   Very Often
   Moderately
   Occasionally

Not at all

10. What do you think of the Battery Bar-style indicator?

11. What do you think of the timer?

12. Are there any ways that could represent this better?

Appendix C

User Study Results

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   2-4 hours
2. Would you say that you have an addictive relationship with social media use?
   No
3. Do you find yourself spending more time than intended when browsing social media?
   Yes
4. So would you say it often feels hard to stop?
   Yes
5. Would you want to reduce this?
   yes
6. What part of the program do you most like?
   The difficulty options and the battery visualisation
7. What part of the program do you least like?
   Swing gui, doesn't look good/professional
8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?
   yes
9. How often do you think you'd use this program?
   Occasionally
10. What do you think of the Battery Bar-style indicator?
    Top notch, best part of the entire program, i go on facebook just to stare at it. So it stopped me from using facebook. Amazing.
11. What do you think of the timer?
    Could be redundant as the battery-bar indicator already give a good indication of how much time you have left.

12. Are there any ways that could represent this better?
    Perhaps an alert system instead so I don't need to constantly check the program or have it blocking parts of the browser.

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   More

2. Would you say that you have an addictive relationship with social media use?
   Yes

3. Do you find yourself spending more time than intended when browsing social media?
   Yes, especially when I have work deadlines

4. So would you say it often feels hard to stop?
   Yes

5. Would you want to reduce this?
   Yes

6. What part of the program do you most like?
   I like the colour bar, it's quite easy to identify.

7. What part of the program do you least like?
   I don't like the timer display size, it feels too small.

8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?
   Yes

9. How often do you think you'd use this program?
   Occasionally

10. What do you think of the Battery Bar-style indicator?
    I really liked it, as I said earlier, could be used for more things maybe.

11. What do you think of the timer?
    I don't think it is big enough to be reminding me of how much I have left, I'd like it to be bolder.

12. Are there any ways that could represent this better?
    Maybe you could have a bigger timer.

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   1-2 Hours

2. Would you say that you have an addictive relationship with social media use?
   No

3. Do you find yourself spending more time than intended when browsing social media?
   Yes

4. So would you say it often feels hard to stop?
   No - I don't find it particularly hard to stop most times.

5. Would you want to reduce this?
   No

6. What part of the program do you most like?
   I like that I can choose which diet suits me, and that I can reset anytime if I don't fancy it.

7. What part of the program do you least like?
   I don't like the look and feel of the buttons, they could look more professional.

8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?
   Yes

9. How often do you think you'd use this program?
   Moderately

10. What do you think of the Battery Bar-style indicator?
    I think it's OK, personally I think just having a timer would be enough for me, but the bar does offer something to look at.

11. What do you think of the timer?
    I like that it counts down, shows me exactly how much time I have left.

12. Are there any ways that could represent this better?
    You could have an hour glass instead, I think it would be more stimulating for ticking down.

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   More

2. Would you say that you have an addictive relationship with social media use?
   Yes

3. Do you find yourself spending more time than intended when browsing social media?
   Definitely

4. So would you say it often feels hard to stop?
   Yes

5. Would you want to reduce this?
   Yes

6. What part of the program do you most like?
   That it covers several different social media websites.

7. What part of the program do you least like?
   I would like to personalise the diet time specifically.

8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?
   yes

9. How often do you think you'd use this program?
   Very Often

10. What do you think of the Battery Bar-style indicator?
    I do not feel it is very useful for me.

11. What do you think of the timer?
    It helps me keep track of what I have left.

12. Are there any ways that could represent this better?
    Using an analogue clock that changes to red when it gets to the end. Have the timer be more persistent on top of full screen browser windows.

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   Less than 1 hour

2. Would you say that you have an addictive relationship with social media use?
   No

3. Do you find yourself spending more time than intended when browsing social media?
   Yes

4. So would you say it often feels hard to stop?
   No, I do not

5. Would you want to reduce this?
   Yes

6. What part of the program do you most like?
   The limited times help, I like that it's actually a small amount.

7. What part of the program do you least like?
   I wanna be able to pick which websites I'd like to be able to track.

8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?
   Yeah

9. How often do you think you'd use this program?
   Occasionally

10. What do you think of the Battery Bar-style indicator?
    It's really cool.

11. What do you think of the timer?
    Looks fine to me.

12. Are there any ways that could represent this better?
    No, that works just fine.

1. So on average, how much would you say you use social media apps such as Facebook, Instagram, Twitter, Youtube during the day.
   2-4 Hours

2. Would you say that you have an addictive relationship with social media use?
   no

3. Do you find yourself spending more time than intended when browsing social media?
   Yes

4. So would you say it often feels hard to stop?
   yes

5. Would you want to reduce this?
   yes

6. What part of the program do you most like?
   The loading bar.

7. What part of the program do you least like?
   I can't decide what is a blacklist website and what isn't.

8. Do you think the idea of reducing over time would help you personally get into a habit of using social media less?
   Yes

9. How often do you think you'd use this program?
   Moderately

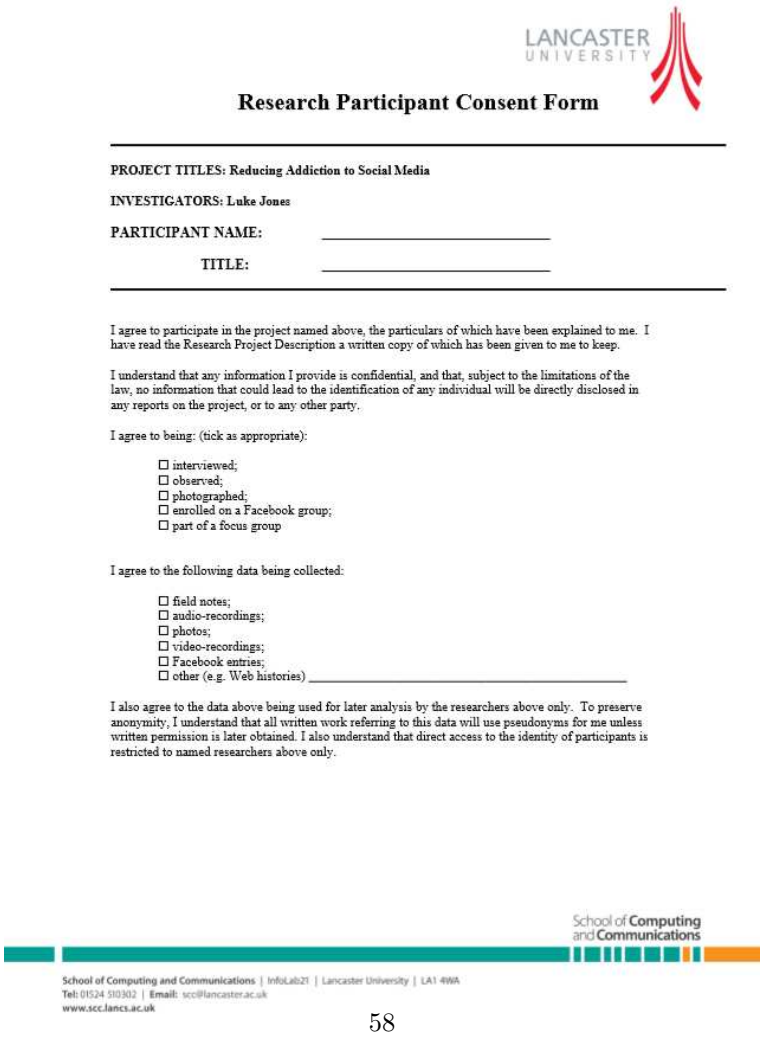
10. What do you think of the Battery Bar-style indicator?
    Decent, I think it is a lot more straightforward than alternatives.

11. What do you think of the timer?
    Maybe it could just be added to the battery bar.

12. Are there any ways that could represent this better?
    Well if you just had the battery bar, it would be a lot simpler and maybe even smaller.

Appendix D

Participant Consent Sheet



LANCASTER UNIVERSITY

Research Participant Consent Form

PROJECT TITLES: Reducing Addiction to Social Media

INVESTIGATORS: Luke Jones

PARTICIPANT NAME: _____

TITLE: _____

I agree to participate in the project named above, the particulars of which have been explained to me. I have read the Research Project Description a written copy of which has been given to me to keep.

I understand that any information I provide is confidential, and that, subject to the limitations of the law, no information that could lead to the identification of any individual will be directly disclosed in any reports on the project, or to any other party.

I agree to being: (tick as appropriate):

- ☐ interviewed;
- ☐ observed;
- ☐ photographed;
- ☐ enrolled on a Facebook group;
- ☐ part of a focus group

I agree to the following data being collected:

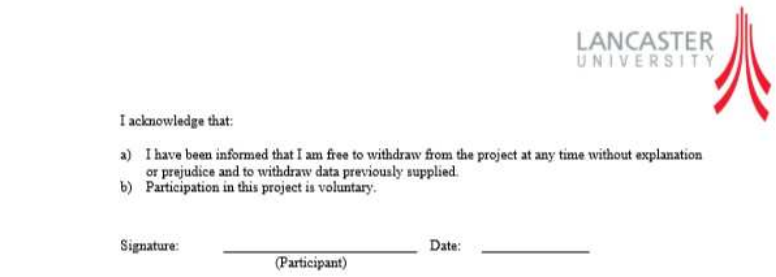
- ☐ field notes;
- ☐ audio-recordings;
- ☐ photos;
- ☐ video-recordings;
- ☐ Facebook entries;
- ☐ other (e.g. Web histories) _____

I also agree to the data above being used for later analysis by the researchers above only. To preserve anonymity, I understand that all written work referring to this data will use pseudonyms for me unless written permission is later obtained. I also understand that direct access to the identity of participants is restricted to named researchers above only.

School of Computing and Communications

School of Computing and Communications | InfoLab21 | Lancaster University | LA1 4WA
Tel: 01524 510302 | Email: scc@lancaster.ac.uk
www.scc.lancs.ac.uk

Figure D.1: Participant Consent Part 1



LANCASTER UNIVERSITY

I acknowledge that:

a) I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw data previously supplied.
b) Participation in this project is voluntary.

Signature: _____ Date: _____
(Participant)

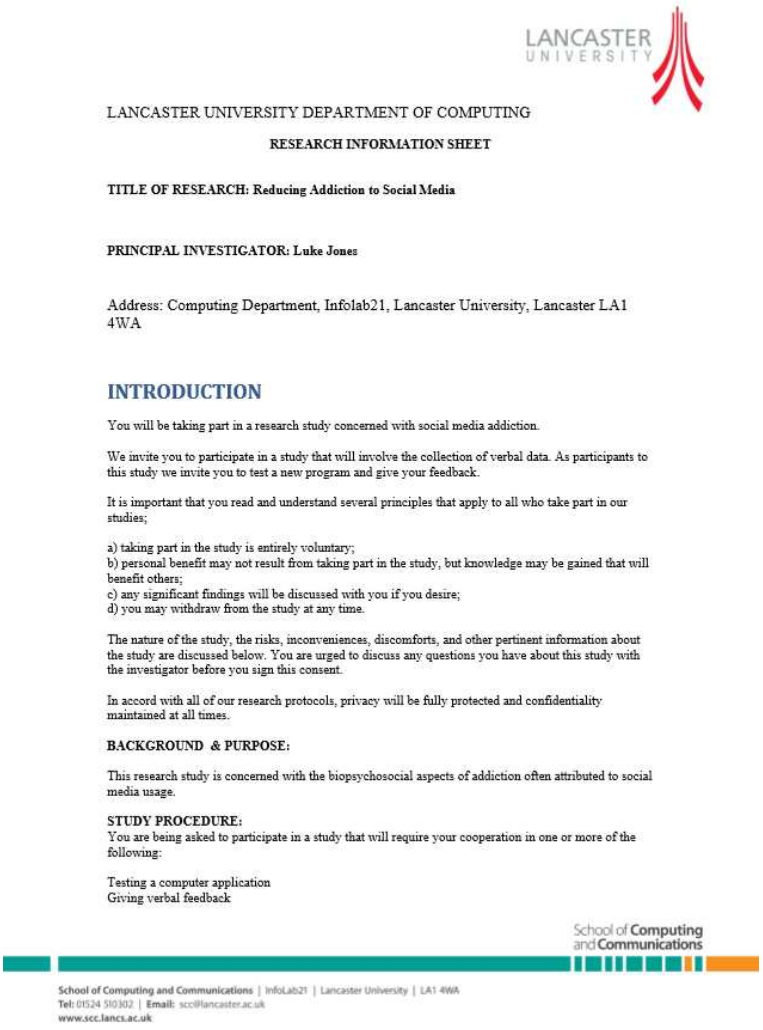
School of Computing and Communications

School of Computing and Communications | InfoLab21 | Lancaster University | LA1 4WA
Tel: 01524 510302 | Email: scc@lancaster.ac.uk
www.scc.lancs.ac.uk

Figure D.2: Participant Consent Part 2

Appendix E

Participant Information Sheet



LANCASTER UNIVERSITY DEPARTMENT OF COMPUTING

RESEARCH INFORMATION SHEET

TITLE OF RESEARCH: Reducing Addiction to Social Media

PRINCIPAL INVESTIGATOR: Luke Jones

Address: Computing Department, Infolab21, Lancaster University, Lancaster LA1 4WA

INTRODUCTION

You will be taking part in a research study concerned with social media addiction.

We invite you to participate in a study that will involve the collection of verbal data. As participants to this study we invite you to test a new program and give your feedback.

It is important that you read and understand several principles that apply to all who take part in our studies;

a) taking part in the study is entirely voluntary;
b) personal benefit may not result from taking part in the study, but knowledge may be gained that will benefit others;
c) any significant findings will be discussed with you if you desire;
d) you may withdraw from the study at any time.

The nature of the study, the risks, inconveniences, discomforts, and other pertinent information about the study are discussed below. You are urged to discuss any questions you have about this study with the investigator before you sign this consent.

In accord with all of our research protocols, privacy will be fully protected and confidentiality maintained at all times.

BACKGROUND & PURPOSE:

This research study is concerned with the biopsychosocial aspects of addiction often attributed to social media usage.

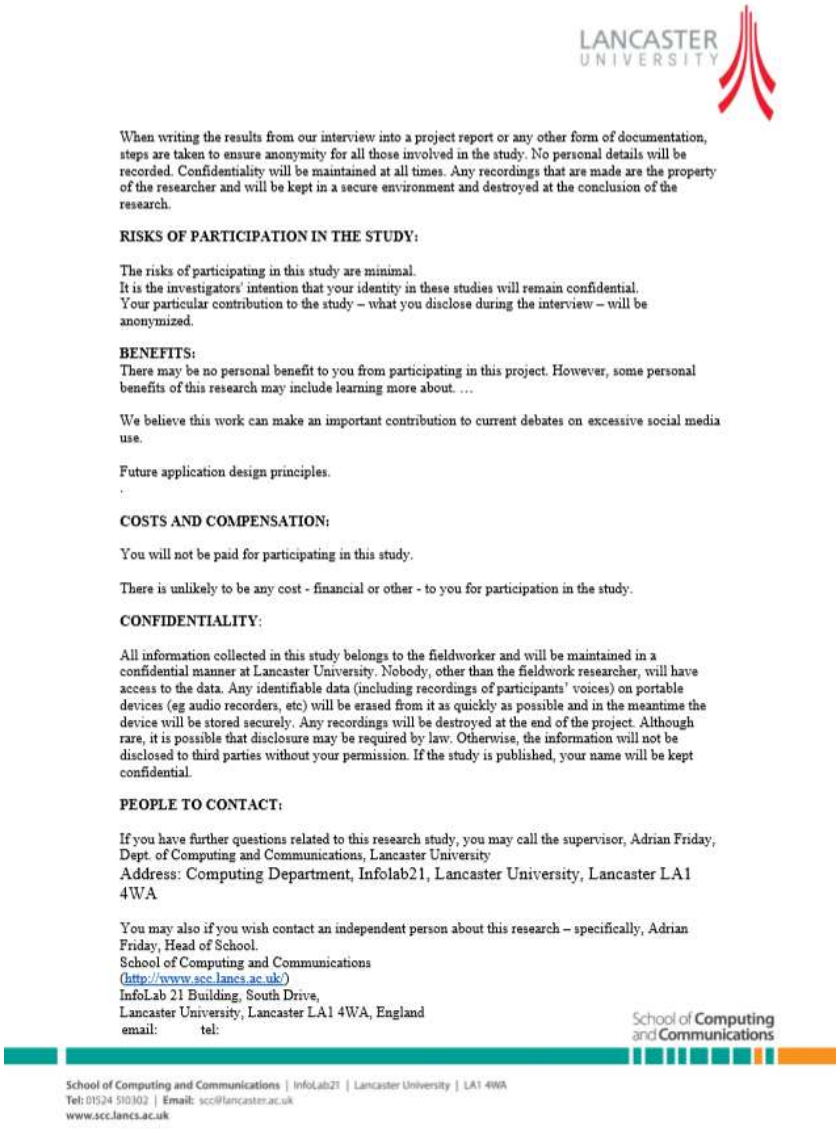
STUDY PROCEDURE:
You are being asked to participate in a study that will require your cooperation in one or more of the following:

Testing a computer application
Giving verbal feedback

School of Computing and Communications

School of Computing and Communications | InfoLab21 | Lancaster University | LA1 4WA
Tel: 01524 510302 | Email: scc@lancaster.ac.uk
www.scc.lancs.ac.uk

Figure E.1: Participant Information Part 1



When writing the results from our interview into a project report or any other form of documentation, steps are taken to ensure anonymity for all those involved in the study. No personal details will be recorded. Confidentiality will be maintained at all times. Any recordings that are made are the property of the researcher and will be kept in a secure environment and destroyed at the conclusion of the research.

RISKS OF PARTICIPATION IN THE STUDY:

The risks of participating in this study are minimal.
It is the investigators' intention that your identity in these studies will remain confidential.
Your particular contribution to the study – what you disclose during the interview – will be anonymized.

BENEFITS:
There may be no personal benefit to you from participating in this project. However, some personal benefits of this research may include learning more about. …

We believe this work can make an important contribution to current debates on excessive social media use.

Future application design principles.
.

COSTS AND COMPENSATION:

You will not be paid for participating in this study.

There is unlikely to be any cost - financial or other - to you for participation in the study.

CONFIDENTIALITY:

All information collected in this study belongs to the fieldworker and will be maintained in a confidential manner at Lancaster University. Nobody, other than the fieldwork researcher, will have access to the data. Any identifiable data (including recordings of participants' voices) on portable devices (eg audio recorders, etc) will be erased from it as quickly as possible and in the meantime the device will be stored securely. Any recordings will be destroyed at the end of the project. Although rare, it is possible that disclosure may be required by law. Otherwise, the information will not be disclosed to third parties without your permission. If the study is published, your name will be kept confidential.

PEOPLE TO CONTACT:

If you have further questions related to this research study, you may call the supervisor, Adrian Friday, Dept. of Computing and Communications, Lancaster University
Address: Computing Department, Infolab21, Lancaster University, Lancaster LA1 4WA

You may also if you wish contact an independent person about this research – specifically, Adrian Friday, Head of School.
School of Computing and Communications
(http://www.scc.lancs.ac.uk/)
InfoLab 21 Building, South Drive,
Lancaster University, Lancaster LA1 4WA, England
email: tel:

School of Computing and Communications

School of Computing and Communications | InfoLab21 | Lancaster University | LA1 4WA
Tel: 01524 510302 | Email: scc@lancaster.ac.uk
www.scc.lancs.ac.uk

Figure E.2: Participant Information Part 2

Feedback comments

FIRST MARKER : Comments on written report:Well structured and presented. Background section is quite well done, although is not clear on the scope & method used to find the literature or to backup how known or contentious the theories of addiction are, but I do like the reference to principles of addiction. Elements are there - e.g. wireframes, UML, but design process followed and link to the ‘properties of addiction’ are not made clear, many design decisions are just assumed and the rationale not explained. These are again somewhat lost explicitly in the implementation section, where the exploration and algorithms could do with better explanation. Technically there is a basic implementation, but the level of technical achievement overall is low. Evaluation of the system or with users is fairly hurried, but does elicit some feedback - would’ve like to have seen more discussion of what the users thought (e.g. using transcript quotes), and tighter analysis & ‘what was learnt’ flowing from this. Overall, a complete end-to-end piece of work, well presented writeup. --- Viva Comments:Remote viva was well prepared for and conducted with a mix of live presentation, Q&A and pre-recorded demo. Questions handled well and objectively, we surfaced a number of the previously hidden design assumptions, and Luke defended his overall approach well. Technically, we confirmed that the level of technical achievement is low: the codebase is small, with some evidence of good coding practice, albeit without comments, test cases etc. Thresholds relating to the diet are hard coded literal (not even named constants). Would really expect a greater appreciation of the need to configure these parameters either using configuration files or UI components at this level. Overall, a good and useful viva, well handled by Luke. I do believe that he is more capable than evidenced by the overall level of achievement. SECOND MARKER: Comments on written report:b'The thesis well written and the style good. The substance though is somewhat lightweight, with a tendency towards tautology. That social media cna be addictive is a common notion, though its meaning is not like that used for chemical addiction, it holding a family resemblence. The analysis of the experience of needing social media therefore needs a different kind of nuance - the measures are, to put it simply moral rather than physiolgical, and quantitative criteria can be distracting. If one uses social media to learn, for example, and spend several hours doing so, is that additive behaviour or diligent? These sorts of issues, though obvious, seemed obscure in the research and not made the givens they ought to have been. \r' --- Viva Comments:Teams viva was well done and the student appeared to have practiced. Discussion focused on matters of depth and scope, and the student seemed aware that his efforts were not great. The general impression was given that the student thought he might have done more in the project, a feeling that the examiners had too.