# SCHOOL OF ELECTRONICS AND COMPUTER SCIENCE

## INFO6005 - Application Development Report

OptiCaff

By Adam Costello, Michael Elkins, Jonathan Harrison, Samantha Kanza, Pratik Patel & Craig Saunders

# Abstract

# Contents

# 1    Introduction

OptiCaff is the new innovative way to maximise your productivity during university hours! By analysing your caffeine content in addition to your weekly timetable, OptiCaff can work out the optimum time for your next caffeine consumption. However, this is not all it can do. Not only will it notify you when its time for you to consume your next caffienated beverage, it will tell you what type will be most effective (tea, coffee, energy drinks) and then point you to the nearest place in and around the University of Southampton that sells that product. It also has a competative element to it, users can compete with one another to appear on the leaderboard listing the most productive users.

## 1.1    Project Problem

Modern life is both busy and stressful. People have long since started turning to caffeine to help them to manage their tiredness levels and keep them going throughout the day. However, caffeine, despite its uses is still a drug and can have adverse effects if misused. In addition to this, its not always easy to remember where the closest point of service to you is or whether they sell the type of caffeine you are after. OptiCaff aims to solve these problems by aiding the user in managing their caffeine dosage in addition to pointing them towards the closest place to buy their desired beverage.

## 1.2    Project Audience

The current audience of this project is anyone that visits the University of Southampton or surrounding area on a regular basis. The points of service that are pointed to by our applications are all either University of Southampton affiliated or very near the main campus and therefore are regularly accessible to any frequent visitors of the University.

## 1.3    Project Goals

The goals of this project are to produce a prototype that has the following functionality:

- Obtain data regarding caffeine sources in and around the University of Southampton.

- Store users calendar data.

- Make calculations about user caffeine intake and make predictions for the optimum time to consume next.

- Use the notion of a leaderboard to rank users "productvity" based on maintaining their optimum caffeine levels.

- Ascertain the users position and locate the closest appropriate caffeine sources to them.

## 1.4    Project Scope

This is a prototype application to showcase the main features and to illustrate what the full application will look like. The prototype produced will display all the features available in the user interface and the key ones such as: consuming caffeine, calculations based on your timetable, ranking on the leaderboard etc will be implemented. This application will use researched averages for the caffeine content of drinks as opposed to storing individual data for each one and will make assumptions on the average man and woman in terms of optimum caffeine intake. In addition the calendar the application uses to base the users daily events off will be statically added for the purposes of this prototype.

# 2 Background Research & Analysis

## 2.1 Market Research & Analysis

This section details the market research analysed for Opticaff. The Coffee market was researched to see if it was a profitable industry and the different mobile development platforms were researched and analysed to determine the most suitable one to use. Finally the potential competitors to Opticaff were detailed and analysed to see if any of them held a genuine threat against it.

### 2.1.1 Coffee Research & Analysis

Coffee consumption in the United Kingdom has steadily increased over the past decade. In particular the past five years been seen an explosive increase, there are several theories as to why this is the case.

Firstly, instant coffee shops have become more common on our high streets. Companies such as Starbucks and Costa have been opening more stores as more Brits have been buying instant coffee, this doesn't show any signs of slowing down either as Starbucks have recently announced 300 new stores to be opened over the next five years [14].

Secondly, these brands have contributed to the newfound 'coolness' that is associated with coffee.

Lastly, there is evidence that the economic climate has played a part in coffee's rise. Also known as the 'lipstick effect', Britons have been unable to afford expensive treats for themselves so they have been spending on cheaper treats, a good example of which is coffee [15].

This research is important to OptiCaff because it shows that the coffee industry is on the rise, it would not make business sense for us to invest in a declining industry.
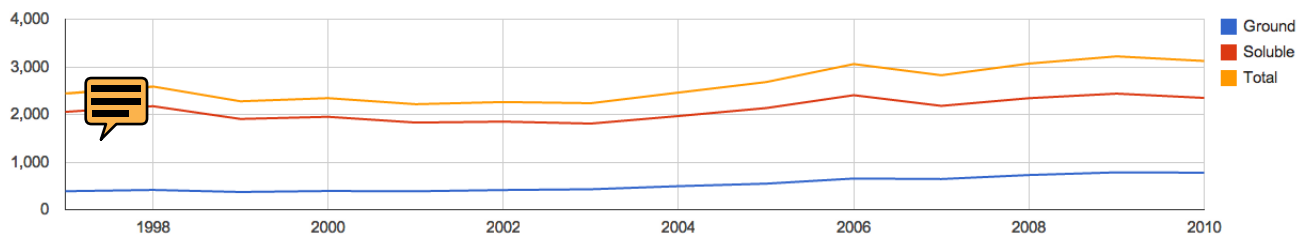


### 2.1.2 Mobile Platform Research

There are two mobile operating systems that OptiCaff could be deployed upon. The Android operating system created by Google requires applications to be written in Java which is a positive for the OptiCaff team, all members have Java development experience with one member having Android development experience. Using Android also means no special hardware is required to develop an application, the Android SDK is freely available and IDE's are also free, Eclipse being an example of this [11]. The app store for Android phones, Google Play, is a large marketplace that would give OptiCaff a great enough set of potential users.

"Google's 10 Billion Android App Downloads: By the Numbers"
A negative of Android is the result of it being open-source, manufacturers are able to create a separate version of Android just for their hardware, this means there are now lots of iterations of Android, developing an application for all these different versions is difficult and OptiCaff would not be compatible with all phones at first.

iOS is the Apple iPhone's operating system, it requires applications to be written in Objective

C, no members in the OptiCaff team have any experience with Objective C. The only IDE available for developing iPhone applications is Xcode which is only available to OS X users, in other words, development is only possible on Apple computers, this is a requirement that is particularly limiting for a small development team. The Apple app store is currently the largest marketplace for mobile applications, although it is slightly ahead of Google Play. Finally, there is only one iteration of iOS, it is not licensed to other companies, the only complication is that there are a few versions running concurrently. This means that an app developed for the iPhone would likely work on all iPhones.

OptiCaff will be developed in Android, the reasons for this are that the members of the team are more comfortable with Java development and not all members of the team have an Apple computer and therefore would not be able to aid in development.

### 2.1.3   Gamification Research & Analysis

A common issue for new apps is user retention, a method of increasing user retention is Gamification [6]. Gamification is the practise of adding game-like elements to something that is not already a game, e.g. a to-do list [5]. There are ways in which gamification can be applied to OptiCaff.

1. Use of achievements or awards. Achievements are used to recognise when a player has fulfilled certain conditions when playing a game. An example of how this could be used with OptiCaff would be giving an achievement to a user that has stayed in the optimum caffeine range for 3 hours.

2. Use of leaderboards. A leaderboard would show the users that are the best at using OptiCaff in a specified way, an example of this would be show the users that stay in the optimum range for the longest time.

One of the dangers of gamification is extreme behaviour, OptiCaff will not reward behaviour that is potentially dangerous, e.g. rewarding the user that has the highest caffeine intake.

OptiCaff would use leaderboards as a method of gamification, provided that it is done in a safe way. This is because leaderboards can link all of the users of OptiCaff turning it into a multiplayer game.

### 2.1.4   Monetisation Research & Analysis

Making money from applications is essential for a company that plans to develop more products and to keep its workforce. It is not imperative for the team to make money from OptiCaff but it is prudent to research how making money they would be possible.

Android applications are particularly difficult to make money from according to a report from Distimo, an app store analysis company [10]. The report suggests several methods to maximise the money earned, these assume that the app is high enough quality to be sold.

1. 80% of paid applications have been bought less than 100 times. This shows that making OptiCaff a free application would be sensible decision to get the largest amount of downloads possible.

2. In-app advertising can either make a lot of money or very little, it depends on the amount of users an app has. By making the app free the team hope that OptiCaff will have a high number of downloads and therefore have a large income through advertising.

3. Finally, it is common on app stores/marketplaces to have a paid version of an app that is also free. There is no difference in the function of the app, though a paid version would

not display advertisements. This would give the user the choice to use the OptiCaff free or paid version though there would be income for the team either way.

Based upon these three points it has been decided that OptiCaff would be developed as a free and paid version that contains advertising in the free version. OptiCaff is unlikely to be released onto the Google Play Store but this research helps show what would happen in the event it was released.

### 2.1.5   Competitors Research & Analysis

There are direct and indirect competitors to OptiCaff.

Caffeine Finder is a BlackBerry application that offers a lot of the same functionality that OptiCaff will provide, this makes Caffeine Finder a direct competitor of OptiCaff. Caffeine Finder will direct a user the nearest restaurant or cafe, give the address and even display reviews of the destination. There are several negative points about this application to make however, firstly the chosen platform was the BlackBerry which has a small screen compared to Android phones and iPhones. Secondly, the application doesn't inform the user when the optimum time to have a coffee or other caffeinated drink is, a user may already be tired before they think to check Caffeine Finder which is something OptiCaff will try and prevent. Finally, the application was released in 2005 and has not been updated regularly since that time, this is shown by reports that it is not fully compatible with newer operating systems.

Caffeine Zone 2 Lite is a free iPhone application that tracks the amount of caffeine in the body, OptiCaff will also have caffeine tracking ability and alerts. This makes Caffeine Zone 2 Lite a direct competitor, although OptiCaff will be better for the following reasons. Firstly, OptiCaff offers a complete solution, Caffeine Zone 2 Lite only tells the user when they should have caffeine, it makes no effort to tell the user where they can get a caffeinated drink. Secondly, the alerts generated do not consider the user's schedule, OptiCaff will look at the user's calendar to see if they require an earlier warning. Finally, Caffeine Zone 2 Lite is focussed on being an educational tool about caffeine use this is in contrast to OptiCaff which will prioritise providing a service.

One of the issues of using open data is that the data itself can be considered an indirect competitor of OptiCaff. It could be possible for another product to be created that uses the same data set, this means that OptiCaff could have more potential competitors than it would if it used closed data. OptiCaff could not be replicated by a competitor only using the same open data however, this is because there will be caffeine level prediction and notification features implemented.

| | Caffeine Finder | Caffeine Zone | Caffeine Data | Opticaff |
|---|---|---|---|---|
| Does this app allow you to locate caffeine sources? | ✔ | ✘ | ✔ | ✔ |
| Does this app direct you to caffeine sources? | ✔ | ✘ | ✘ | ✔ |
| Does this app help you to manage caffeine content? | ✘ | ✔ | ✘ | ✔ |
| Does this app help you to manage caffeine content in relation to your day's activities? | ✘ | ✘ | ✘ | ✔ |

## 2.2   Application Research & Analysis

This section details the research and analysis for the data within our application. The calendar data we will use for the application is detailed, as is the caffeine calculations that will be used in the prototype.

### 2.2.1 Calendar Research & Analysis

OptiCaff's objectives include the use of university timetables to schedule caffeine level notifications. Sussed is Southampton university's student portal that displays a student's timetable, OptiCaff will need to access the timetable through Sussed. This is the only way to get a student's timetable because it is university data that is not freely available, i.e. it is closed data. Another Southampton university produced application, iSoton, has been able to do this process showing that it is possible. Further investigation has shown that the timetable information is very difficult to access through Sussed, it requires work that would mean neglecting key features of OptiCaff and therefore cannot be pursued.

An alternative that will work however is using Google Calendar instead. Google Calendar can be highly integrated into Android because they are both Google products, this is of great benefit to OptiCaff [1]. A drawback of using Google Calendar is that it relies upon the user using it, although, it is not required for using OptiCaff. Using Google Calendar is easier than using Sussed and it is feasible, this is why OptiCaff will use it.

### 2.2.2 Caffeine Research & Analysis

In order to provide the caffeine management element of this application, the different levels of caffeine that appeared in beverages and its affect on human beings needed to be researched. This section details the caffeine levels and decay rate that has been used in Opticaff.

Caffeine Levels in Products
Given the vast range of different cafffeinated products and the limited time to produce a prototype application, it was decided that the products displayed by OptiCaff would be grouped into four different types of drink, and each type would be allocated an average caffeine content. Below is a table showing these totals, which were obtained these sources [12] [13] [16].

| Drink Category | Average Caffeine Content (mg) |
| --- | --- |
| Tea | 40 |
| Coffee | 54 |
| Energy Drinks | 80 |
| Soft Drinks | 34.5 |

Caffeine Decay Levels
In addition to calculating the level of caffeine obtained from a specific product, it was also important to work out the optimum caffeine levels and how long it would take the caffeine to "decay" within the body so that the next dosage time could be predicted. For the purposes of the prototype, Opticaff uses the same optimum caffeine levels as it's competitor Caffeine Zone 2 (detailed in Section 2.1.5) uses which are between 200 and 400mg [20]. The half life of caffeine ranges between 2.5 and 4.5 hours [21] [19] and to simplify matters 4 was chosen as the number to use in Opticaff and was calculated using the half life formula detailed here: [22].

# 3   Project Conceptualisation & Monetisation

This section details an outline of the ideas that were conceived and the justifications for the final idea coupled with its monetisation potential.

## 3.1   Ideas

It was decided from the early stages that the application would use the University of Southamptons open linked data (see section **??** relating to its internal organisations. The focus of this data would be the points of service (e.g cafes, vending machines) that sold caffeine in and around the University. After establishing the data sets a number of ideas of how to best uitlise this data were brought to the forefront. In order to establish the most valuable idea, each potential solution was weighed against certain aspects:

- **Uniqueness Factor:** Was it a new novel idea and if so how?

- **Monetisation Potential:** Was there the potential to make money out of it?

- **User Interest:** Would it capture users on a long term basis as opposed to just on a novelty?

### 3.1.1   Caffeine Finder

An initial idea was a caffeine finder application that allowed the user to find the nearest, available, appropriate (e.g Student or Staff) caffeine to them at any given time.

- **Uniqueness Factor:** As stated in the competitors research section (section 2.1.5 there are apps similar to this in the market currently. It still has a slight unique factor in that it includes all of the University affiliated points of service including vending machines as well as nearby external stores. In addition it also covers a range of caffeinated products as opposed to focusing on tea and coffee. Nonetheless there are still similar applications out that perform similar functions.

- **Monetisation Potential:** There would be the potential to ask specific caffeine selling stores to invest in return for putting them at the top of the applications recommendations.

- **User Interest:** This idea doesn't have a great potential for capturing users interest on a long term basis. It has a novelty factor of showing the users where and when they can purchase caffeine, but runs the risk of loosing interest after the users have used it enough to retain any useful information.

### 3.1.2   Justification for Rejection

Overall this application was considered a decent idea. It wasn't greatly unique but still appealed to both a wide and specialised market in that it would be of use to everyone who frequented the University and it covered all the points of service in a nearby range. However, its main downfall was its lack of ability to maintain a user interest, as without that potential it would be infeasible to expect external parties to invest in it.

### 3.1.3   Caffeine Notifications

Another idea was to make a very simple application that essentially buzzed and notified the user whenever they walked past somewhere that sold caffeine.

- **Uniqueness Factor:** This was debatably more unique than a finder application as it would specifically alert the user to the presence of caffeine as opposed to waiting for them

to search for it.

- **Monetisation Potential:** This idea didn't have a great deal of monetisation potential. If it's going to buzz whenever it passes a caffeine location then there was no feasible way to promote specific locations over others. The only way this could have been monetised would have been to charge for the app. However despite it's potential usefulness it still seemed unlikely that users would actually pay for the service when realistically they could just pay attention and get to know the locations and achieve the same result.

- **User Interest:** This application could easily hold user interest as its a very simple concept and doesn't require any effort on their part apart from keeping the app running in the background.

### 3.1.4 Justification for Rejection

This application had benefits in its simplicity but with its lack of monetisation potential it was unsuitable for this project.

### 3.1.5 Caffeine Productivity with a Competative Edge - Opticaff

The final idea expanded on our inital idea of a caffeine finder application but with an additional function to tie the user interest in. Opticaff is an application that allows users to input their daily timetable and based on user input of caffeine consumption and personal details, calculates when they need to consume their next caffeinated beverage. It uses your calendar for the day to determine if you have any events left (e.g a lecture) and if so it calculates when you should consume caffeine and what strength it should be to maintain optimum caffeine levels throughout. However, this is not the only functionality of the application. It also has the concept of competing with your peers to maintain the optimum caffeine levels with a leaderboard to showcase the most productive users.

- **Uniqueness Factor:** This application had a unique factor in that it had more functionality than any of the competitors mentioned in section 2.1.5. There are applications in the market that monitor caffeine consumption, applications that locate caffeine, and competative applications. This application combines all three for a truly unique product.

- **Monetisation Potential:** This idea retained the potential to be promoted to owners of the caffeine points of service for investment. It could also potentially be pitched to be sponsored in a research function to investigate the effects of monitoring caffeine intake on productivity.

- **User Interest:** This idea has by far the best user interest potential out of the three. It's not just a novelty application as people consume caffeine every day, and based on their different calendars (which for uni students and lecturers will differ by day) and external factors such as amount of sleep the night before their caffeine consumption will differ each day.

### 3.1.6 Justification for Acceptance

Opticaff was chosen as the final idea as it fulfilled all three of the criterion listed above, and fulfilled all of them in a superior fashion. It has the unique factor not through its individual ideas but through the combination of these into a multifunctional app that not only allows you to monitor your caffeine consumption, but to locate places that sell caffeine and tie the two together to optimise your caffeine intake. In addition to this it has the competative element which aids in capturing and retaining user interest as well as boosting potential monetisation potential.

## 3.2 Monetisation

This application has a huge monetisation potential. The obvious initial step would be to pitch for funding from the owners of the caffeine points of service, however there is scope for it to go much further.

Competative applications are becoming increasingly popular as has been shown by our research (INSERT REF HERE). If the application became popular then advertising space could be sold, and two copies of the application could be made available: a free one with adverts and a paid for one without which has been shown as a viable strategy to "convert" people to the paid app [9] [17].

# 4   Design

## 4.1   Interface Design Mockup

## 4.2   Prototype Design

screenshots HCI

# 5   Implementation

## 5.1   Backend implementation

## 5.2   UI implementation

## 5.3   Maps implementation

## 5.4   Implementation Problems

# 6   Project Management & Tools

## 6.1   Project Management

This section details how this project was managed, the roles of the different group members and the methodologies that were used.

### 6.1.1   Team Roles

The following roles were outlined for this project:

- **O**rganiser - Oversees project and time management

- **D**eveloper - Develops the application

- **U**sability Expert - Manages User Interface and HCI (Human Computer Interaction)

- **R**esearcher - Researches background information

- **P**resenter - Presents pitch & manages presentation

This table details the roles each member of the team undertook:

| Team Member | Roles | Description |
|---|---|---|
| Adam Costello | **R, P** | Adam coordinated with Craig on the Presentation section of this project, and worked with Sami on the research section focusing on the market research. |
| Mike Elkins | **U, D** | Mike coordinated with Pratik to design and build the User Interface section of the application. |
| Jonathan Harrison | **O, D** | Jonathan was in charge of organising the team and making sure tasks were completed in a timely manner. He also worked with Sami on the backend element of the application concentrating on the calendar and scheduling the system to import the necessary data. |
| Sami Kanza | **R, D** | Sami coordinated with Jonathan on the backend of the application, concentrating on the queries to retrieve the data, she also worked with Adam on the research section, focusing on the caffeine research. |
| Pratik Patel | **U, D** | Pratik worked with Mike to design and build the User Interface section of the application. |
| Craig Saunders | **P, D** | Craig worked on the location and directing element of the application in addition to working with Adam on the Presentation section. |

### 6.1.2   Team Organisation

The team decided that bi-weekly meetings would be appropriate for this project. In each meeting the progress made between then and the previous meeting was stated, any problems that needed solving were raised and then the tasks for the next meeting were divided up. The nature of these meetings were similar to a SCRUM [18] daily standup, but were obviously performed less frequently than that.

## 6.2   Group Methodologies

The team decided to implement several agile-based technologies to aid with the application development process. The development areas have been broken down into individual tasks

(stories) to simplify the process. An iterative development process was also adopted, with the base of the application built first, followed by a gradual development of its features.

Pair Programming was also an agile technique that the team used. The application development was split into three areas: Database development and SPARQL querying, the map interface and GPS positioning / directions, and the overall user interface. Each section had two group members assigned to it, and each pair worked together to share their skillset and therefore produce a superior result.

## 6.3   Tools & Techniques

This section details the tools used by the team to aid with their project management and development.

### 6.3.1   Version Control

There were several version control mechanisms we could have used. Git and SVN were both considered, with potential to store the code on UGForge or Googlecode or Github etc. In the end the group chose to use SVN Googlecode. SVN was chosen primarily due to the fact that Eclipse was being used as the main development environment, and there is an SVN plugin for Eclipse that makes the subversioning process easier to integrate with the development process. Googlecode was chosen because the application that is being developed is for Android, and therefore it was felt that Android's creators Google would be the most sensible place to store the application.

### 6.3.2   Data Source

OptiCaff used the Open Data Service from the University of Southampton [2] to retrieve the relevant information for the application. This service provides open linked data about some of the administrative information regarding the university. It also provides a SPARQL Endpoint [8] (a service which facilitates users querying a knowledge base using the SPARQL query language) [7]. OptiCaff utilises this with a few specialist queries, and combined with user preferences can provide the user with a wide selection of caffeine choices around campus.

### 6.3.3   Development Tools

Given that OptiCaff was to be an Android application. The development tools needed to facilitate its production were the Android SDK tools [3]. The recommended development environment suggested by Android was to use Eclipse [11] with the ADT (Android Developer Tools) plugin [4]. Given the groups overall familiarity with Eclipse and it's additional useful plugins for version control (see section 6.3.1) this was used as our IDE of choice.

### 6.3.4   Communication Tools

The Team used Google Docs to share documentation and task lists, and Facebook to communicate via group chat.

# 7 Future Work

This application has a great potential for future work. This section details some of the ways in which the application could be extended/improved:

## 7.1 Better Calendar Integration

This system currently uses Google Calendar, in the future it would be useful to extend this to use different calendar such as university timetables so that certain events such as lectures don't need to be input manually to Google Calendar.

## 7.2 Adding Favourite Locations

Adding the notion of favourite products and locations would enable the user to customise the caffeine suggestions that they recieve from the application. For instance if the user only liked tea and coffee but not energy drinks then that would be taken into account for the predictions and they might be advised to consume caffeine more regularly as they favour drinks with a lesser caffeine content.

## 7.3 Accurate Caffeine Levels Per Product

For the purposes of the prototype Opticaff only used average values for the four categories of caffeinated beverages: (coffee, tea, soft drinks and energy drinks) and assumed an average size for each beverage. For a final application each listed product would have it's appropriate caffeine content listed.

## 7.4 Advanced Leaderboard Functionality

Currently within the prototype there is a leaderboard for the optimum caffeine levels. In the finished application it would add a better competative edge to add additional functionality such as a history of scores, mapping caffeine levels to a specific event (e.g I was at an optimum caffeine level during this lecture). It would also encourage competativeness if there was the notion of adding friends so that users could compete directly against their peers. There could also be the notion of groups such as course groups or module groups to see who maintained the optimum caffeine levels within a specific group.

## 7.5 Web Interface

Having a web interface that users could also use to update their information or to view leaderboard statistics could increase the amount of people using Opticaff as there would be multiple ways they could use it.

## 7.6 Dynamic Stock Reflection

If caffeine points of service were to start to release (either publicly or privately just to Opticaff) stock levels of products dynamically then Opticaff could take this information into account and only direct users to places that had the desired beverage in stock.

## 7.7 Health Warnings

Despite its useful traits, Caffeine is still a drug and like all drugs needs to be managed carefully. Opticaff aims to aid the users in managing their caffeine content and keeping it at an optimum level. However, it would be worth adding health warnings about the risks of overdosing on caffeine and to make it clear that Opticaff promotes responsible useage both for health and legal reasons.

## 7.8 Adaptation to other Universities

Given that this system uses Google Calendar to verify the users daily activity, and that the system has been built to import data from a set of SPARQL about the caffeine locations; adapting this application for multiple universities wouldn't take very long. The users would continue to add their timetable data in as before, and a new set of queries would be built for that university. This would enable Opticaff to be pitched to various university establishments for minimum additional development time.

## 7.9 Adaption to Specific Coffee Chains

Based on similar principles as the idea above, this application could be adapted to a specific Coffee Chain such as Costa or Starbucks if they gave Opticaff access to their location and product data. This would then enable the app to be used by anyone who was a fan of caffeine or indeed these specific stores as large chains such as these have branches all over the country.

# 8   Evaluation

## 8.1   Product Evaluation

In regards to achieveing the projects aims, four out of the five goals set out in the initial planning stages were completely met, and one of them was partially met. The table belows details this:

| No | Requirement | Met | Description |
|---|---|---|---|
| 1 | Obtain data regarding caffeine sources in and around the University of Southampton. | Yes | All points of service that are listed as providing caffeine are used within our system. |
| 2 | Store University Timetable data using Sussed | Partially | As discussed earlier in section 2.2.1 accessing the timetable data from Sussed wasn't a simple task so Google Calendar was used instead. This does mean that the users have to input their own timetable data, however it does meet the requirement of using calendar data. |
| 3 | Make calculations about user caffeine intake and make predictions for the optimum time to consume next. | Yes | Opticaff works out the caffeine decay rate (based on the calculations specified in section **??**) and based on the users timetabled events makes a prediction for the best time to consume the next caffeinated beverage. |
| 4 | Have the notion of a leaderboard to rank users "productvity" based on maintaining their optimum caffeine levels. | Yes | A basic leaderboard has been implemented that ranks users based on their caffeine consumption. |
| 5 | Ascertain the users position and locate the closest appropriate caffeine sources to them. | Yes | The long/lat values of all the caffeine points of service are stored by Opticaff. By using GPS the users location can be determined also and then they can be directed to the appropriate destination. |

This shows the the project was very successfull in meeting its aims and the group was happy with the final product and the features it implemented.

## 8.2   Team Evaluation

The group feel that they worked well together as a team. Everyone participated and fulfilled the two roles they were assigned at the beginning of the project. The Bi-weekly meetings were kept to with additional sessions when necessary. The project met its requirements and was delivered on time for the deadline.

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