University of Brighton

Computer Science (Games)

Individual Project - CI301

Interim Planning and Investigation Report

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1 Project Scope

1.1 Aims and objectives

What I will be developing over the upcoming months is an app to help users get out of bed easier in the morning in a useful and information rich way.

My aims are:

- Produce an alarm app with all the functionality users are used to.
- Integrate Smartbulb functionality into the app to turn the light on in the morning with the alarm.
- To turn off the lights at night without having to get out of bed.
- Provide weather information for the day.
- Inform the user of their schedule for the day and upcoming events.
- Publish the application to the play store for download and use by others.

1.2 Stakeholders

I have identified the following stakeholders:

- Myself - Not only am I developing the application making me a stakeholder, I am also very interested in home automation and waking up happy.
- My supervisor, Marcus Winter - By accepting to be my supervisor Marcus is also a stakeholder for my application.
- The second reader - Will also be involved and will be grading my project.
- An expanding user base of smartbulbs - Although the market currently is small the cost of smartbulbs is decreasing making them more available to users.

- Anyone that uses an alarm - The largest stakeholder I have is anyone that uses an alarm on the Android platform. More specifically those who own smartbulbs or other connected devices.

1.3 Communications

I will maintain contact with my project supervisor with monthly meetings where I intend to measure my progress against deadlines and goals, reflect on what progress has been made and address issues, challenges and for development advice to assist me successfully complete my project as planned.

Regular emails will also be used between meetings to keep in contact and keep my supervisor informed of what I intend to talk about and on my progress made.

1.4 Installation Process

I would like to publish my application to the Play store once developed to a satisfactory level. To install an app from the Play store you can simply select the option to install the app and it will be downloaded and installed seamlessly.

I will be ensuring to develop to a high standard and ensure there are no issues, bugs or flaws with my application.

1.5 Quality checks

During development I will ensure to maintain my code and follow the principles that have been taught to me and that I have learnt and will learn, in doing so my code should be easily maintainable, readable and extendable for possible extensions and stretch goals.

I will develop a test plan as I continue to develop my application to allow me to note issues and ensure previous functionality has not been effected by

further developments.

1.6 How will I measure success?

My key performance indicators are outlined below:

- Alarm functionality
- Smartbulb integration
- Weather functionality
- Calendar Integration (Stretch)
- Text to speech (Stretch)

If I am unable to produce a working alarm app with smartbulb functionality I will have failed to achieve what I intended to develop and so these are my highest priority.

1.7 Challenges

There are many challenges I will face during my project these include the following:

- Making my application extensible to other home automation systems such as the *Belkin Wemo*. This would allow for greater flexibility and a larger target audience.
- Handling various devices, there are now many various appliances that are connected to home automation, from washing machines and fridges to door locks and CCTV. Many devices could be useful for morning and night automation, such as closing the curtains at night or turning the kettle on in the morning. Each of these devices will have different functions and are very different from one another. To be able to add several and include them within a scene/scenario to perform multiple actions would be a very powerful inclusion within the app.

- Providing a good level of home automation without making the app cumbersome or difficult to use. My target audience is average users who would like to wake up easier and more refreshed and have their days information available straight away. They don't want to spend ages setting up the light bulbs or struggling to find settings as they will get fed up and stop using and potentially uninstall the app.

2 Specification

2.1 Deliverables

My project has multiple deliverables that I will assign a level of priority to using the must, should, could concept.

The deliverables for my project will be as follows;

Activity	Priority	Deliverable
Writing final report	Must	The final report for the project is crucial and will be undertaken through out the development of my application.
Developing a basic alarm	Must	The application, an alarm app is what my project is based upon and so I will need to develop this before I can develop any further.
Developing a better alarm	Should	The application, a basic alarm will work but I would like this to be an alarm app that has all the features found in any alarm app such as repeat alarms, multiple alarms, etc...
Smartbulb integration	Must	The application, the Smartbulb integration is a main bases of my project and so I will need to include this into my application.
Develop for smartbulbs	Should	The practicality of demonstrating smartbulb integration could be a challenge, by setting up a test platform using an Arduino or raspberry pi would allow me more control than external APIs.

Activity	Priority	Deliverable
Calendar Integration	Should	The application would be improved with calendar integration providing an agenda for the user in the morning.
Text to speech	Could	The application, text to speech is a part of the Android platform and can be used relatively easy and so doesn't contain much of a challenge to it's implementation.

2.1.1 Stages

It would be nave for me to provide a detailed schedule of the activities and stages for my project, however I can identify what I will need to do and in which order as well as estimate a time frame for when I intend to begin the activity.

Activity	Time Frame
Writing the report	Writing the report will be on going throughout the development of my application to allow me to assess my work, identify my challenges and to provide the technical research I undertake.
Design	First week will be spent on this. I don't intend to spend much time of the visual design of my application as it should be fairly simple and can be modified easily.
Prototypes	Will occur prior to new visual changes to my application. I will provide a dummy function to the visual elements that involve interactions to test the look and feel before implementing fully.
Basic Alarm	First four weeks, the basic alarm will be the foundation of my application and as such will need to be developed well using the principles I have learnt.
A test platform	Two weeks following the alarm development, this will take some time to develop

2.1.2 Risk Analysis

There are many risks present with any kind of project, I will be identifying the most relevant and predictable risks and assessing the impact that could be caused. By identifying the risks posed I can attempt to avoid and mitigate these risks and plan for those that I can't control.

Table 3: List of risks.

Risks	Impact level	Reaction
Sickness	Low	Avoid getting ill.
Data loss	Low	Mitigate risk with multiple backups and version control.
Project complexity	Medium	Avoid making it too complex, or too simple.
Scope creep	Low	Avoid implementing features not outlined.
Communication with supervisor	Low	Mitigate by keeping in regular contact.

3 Methodology

3.1 Overview of types of methodology

3.1.1 Development Styles

Rapid Applications Development (RAD) By producing prototypes of the software quickly customers are able to test and provide feedback as the software is developed. This is useful as often requirements change and it's common for developers to produce software that isn't actually what the customer wanted.

Agile Originally project management was slow to adapt to changes with user review coming in late stages of development. Agile however aims for incremental development with regular feedback. (Admin 2008)

The most popular form of agile development is the Scrum (Admin 2008) scrum is suited towards small teams and requires close involvement by the product owner to provide regular feedback and review.

Lean Much like scrum and other agile methodologies aims to produce software quickly and involves close coordination with the product owner, where lean varies is that it wants to reduce waste by selecting the most valuable features required.(*What Is Agile Methodology?*).

Waterfall Focuses on phases such as; requirement gathering, analyses, development and testing. Each phase is completed entirely before moving onto the next phase and is often depicted by the phases flowing steadily downwards resembling a waterfall.

Spiral The spiral model is based on the incremental model and consists of four phases; Planning, risk analysis, engineering and evaluation (*What is Spiral model- advantages, disadvantages and when to use it?*). A project will go through each phase multiple times in an iterative process or spirals. This is very well illustrated in the figure below.

Time Boxing Involves strict deadlines rather than goals. By developing up to the agreed upon time and evaluating progress this can allow for steadier development and a set time in mind which provides a deadline for development.

Evaluating at the end of the time frame can show struggles in the development process and provides the ability to address them rather than simply spending more time to complete the goal.

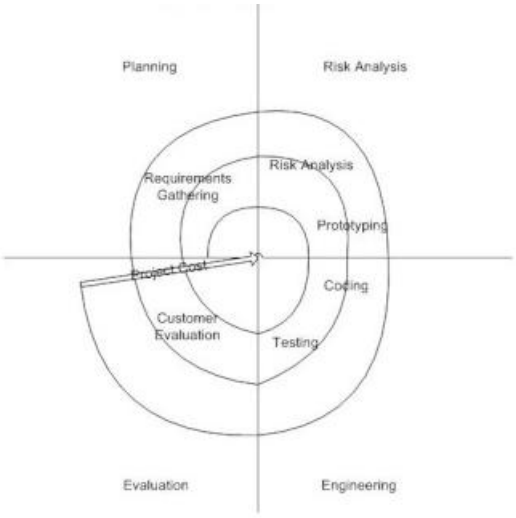

Figure 1: Spiral model diagram (*What is Spiral model- advantages, disadvantages and when to use it?*)

3.2 Choice of methodology

After assessing the various forms of project methodologies I have decided to use an agile methodology most notably the Lean methodology as this will provide me the ability to develop core functionality in a fast pace and add other features time permitting. To assist my development I will also be using time boxing to allocate time for my applications functions and allow me to perform regular performance reviews so I can identify time sinks and other issues to allow me to manage them.

3.3 Project Time line

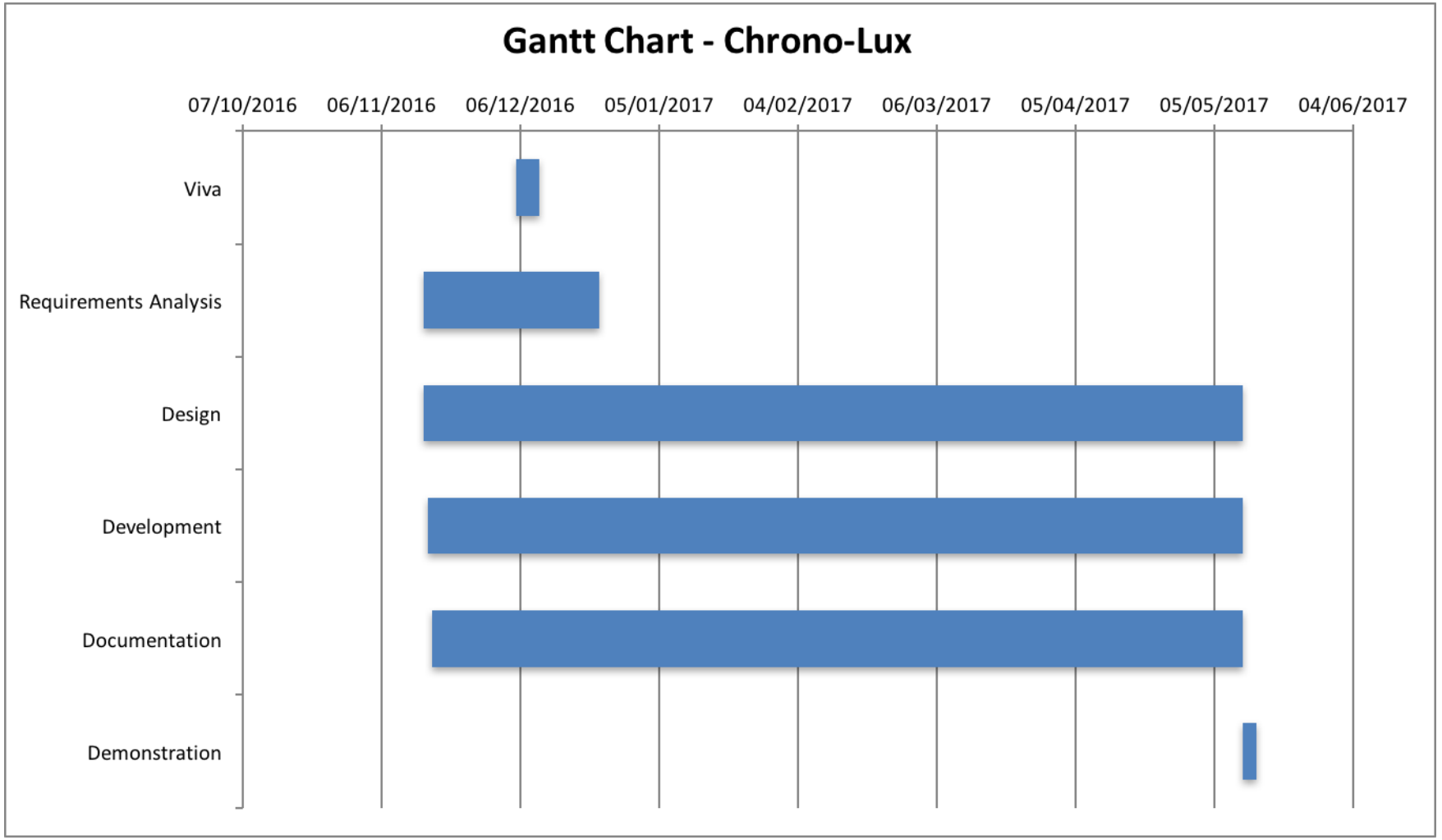

Figure 2: Project Gantt Chart

4 Literature Review

There a currently several home automation systems available to the public market including smart heating with the Hive 2016 and Nest 2016, automated lighting with the Philips 2016 and integrated automation in the form of the Amazon 2016 which provides a wide array of functionality and can be linked with many of the previously mentioned systems to provide whole home automation.

The market of home automation is growing while the cost of entry decreases, with advancements in LED technology the Philips 2016 has become more affordable. The Amazon 2016 is also at a very affordable price with Amazon keeping the costs low to increase market saturation.

Current devices use the Bluetooth low energy and Wi-Fi standards, often with a internet connected hub to handle communications. Wi-Fi is relatively power intensive and provides a bandwidth excessively large for the application, while BLE has limited range.

New standards Z-Wave 2016 and ZigBee Alliance 2016 are being developed, both using far less power allowing for extended battery life. Both have limited range like BLE however Z-Wave 2016 is designed to create an interconnected network between devices to maintain low power while extending the range.

4.1 Philips Hue

The Philips 2016 system uses the ZigBee Alliance 2016 standard, though all of this is transparent as the method of interfacing with the devices is to use ‘GET’, ‘PUSH’, ‘POST’ and ‘PUT’ URL requests and provide JSON formatted commands in the body to interact.

The state of a specific light can be received using ‘GET’ and providing the URL /api/devID/lights/1 or all of the lights by not specifying the number.

The state can be changed using ‘PUT’ instead and providing attributes and their values that you would like to change, for example:

```
1 {"on":true, "bri":255}
```

A few useful attributes: on = true/false bri = Brightness between 0 and 254

Colour settings include: sat = Saturation between 0 and 254 hue = The hue of the light (hue runs from 0 to 65535)

4.2 Human Perception of Light

Many human senses are based on a logarithmic scale, this is to say we are far more able to distinguish changes in light or sound in the lower band of the senses compared to higher, so whispering occurring will have a more distinguishable change in volume than two jet engines roaring.

The same applies to sight, it is more important to distinguish details in low light such as that from the moon compared to the light change of daylight at varying times of the day. We do this to normalise our senses to best suit our environment.

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All links were last followed on the 16th of November, 2016