

G6 Internet Explorers



keeping plants alive.

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# Introduction

Born from a growth in high-rise living, balcony gardens are fast becoming the new Aussie backyards — with green oases flourishing in places you would least expect. Data from the Australian Bureau of Statistics showed that apartment living was on the rise. (*As the popularity of apartment living increases, downsizing a garden becomes a new challenge - ABC News (Australian Broadcasting Corporation)*, no date)

Plants contribute to reducing the amount of toxins in the air and provide benefits to mental health and reduced stress. Balcony gardens are entirely dependent on humans. (*How a pot plant or five is good for you | Pursuit by The University of Melbourne*, no date). However, many urban dwellers struggle to keep their potted plants or herb gardens healthy and alive. This is where our product gardenMates steps in to assist.

In the following pages we introduce the members of the team working on this project.

The project details including deliverables and risks, as well as discuss the project management process we have implemented. The members of the G6 Internet Explorers team invite you to discover more about gardenMates.

# Team Profile

## Team Name

The Team name of G6 Internet Explorers was chosen to reflect our group numbers ie six and the fact that we would be using the internet to research our project. G6 also has connotations of an elite group such as the Group of Seven Organisation of Advanced Economies.

## Personal Information

My name is Brian Dean and my RMIT student number is S3831349 and I am a member of the G6 Internet Explorers Team. I was born in Brisbane, though spent much of my working life in Sydney. My wife and I are now living on the northern beaches of Cairns in a little spot called Yorkeys Knob, with our twelve year old ginger rescue cat called "Pumpkin", who shares by birthday day and month. I enjoy reading, mainly sci fi fiction, cooking and a spot of gardening. Currently self employed as a technology consultant to the hospitality and tourism sector, having worked in that industry and software houses for many years. I am enrolled in this Bachelor of I.T. degree to fill in the many holes in my knowledge and for accreditation for all those years of doing.

My name is Daria Sukonnova, my RMIT student number is S3812576 and I am a member of the G6 Internet Explorers Team. I was born in the Russian city named Khabarovsk but then we moved to the Northern capital of Russia - St. Petersburg. I enjoy doing many things such as playing the piano or drawing. My biggest passion is reading books of any genre. My dream is to become an Artificial Intelligence Engineer. I find writing code quite enjoyable. My first program was a primitive game on Unity which was created with a tutorial. Since that time I really like solve code challenges on Python. Hope that in the near future I will develop the necessary skills to achieve my goal.

My name is Jeremy Naupay my RMIT student number is S3831039 and I am a member of the G6 Internet Explorers Team. I have grown up in the Sydney area since the day I was born. I love using my spare time to play around with different operating systems and brushing up on knowledge base. I have worked in I.T for over 2 years now as an IT Support Officer and looking forwards to be a Chief Information Officer in the future. Sometimes i do love to plan our model train sets as a hobby, but i also enjoy just playing video games and working on modding games in general.

My name is Shane Thacker, and my current home is Toowoomba Queensland. My RMIT student number is s3827970 and I am a member of the G6 Internet Explorers Team. Born in Adelaide, I moved to Queensland when I was eighteen, where I got a job in the furniture industry. By twenty, I was going back and forth to Indonesia to train the suppliers on how to sand, prepare, upholster, assemble, glaze and upholster furniture for the Australian company I was working for. At twenty-one, I made the permanent move to Indonesia working for that company then eventually by the time I was twenty-two started my own teak outdoor furniture company. After the 2008 global crisis wiped out my customers, then me off the map, I worked for a European company managing their properties in Indonesia. When those properties were sold off in 2015, I joined an international school and became the school director.

My main interests are barbeque low and slow and fishing, both of which involve knocking back a few cold beers. I have three kids the youngest being six and extremely naughty, most likely because he is too spoilt. Flight simulation is my main “do on own” hobby, but I rarely find time these days.

I am working towards a Bachelor of International Business where I hope to move into a management position of an international company within the next five years.

## Group Processes

At the time the work on the Assignment 2 began, the members of G6-Internet-Explorers group were not familiar with each other. However, this fact did not prevent the group from working cohesively and effectively.

Cooperation was one of the strongest sides of our group (and it is still true). Despite the fact that some of us live in different time zones, we were able to find time for regular conferences where we discussed the progress of our work. Everyone was respectful and organized.

Passion for work is the key to its success and our group have proved it. Everyone had a huge amount of ideas and interesting vision of our work.

Our group process consisted of discussing our working plan on the regular video-conferences, chatting in Microsoft Teams and posting our work on GitHub.

All in all, our group worked really efficiently on the Assignment 2. The change that we will introduce is even better communication as now we have developed our group working skills.

## Career Plans

**Ideal jobs comparison:**

Every member of our team has different experience, dreams and career plans. Though, it does not mean that there are no common elements in our future job plans.

Ideal jobs:

Jeremy - Chief Technology Officer

Brian - Solution Architect

Shane - Principal Data Insights Analyst

Daria - Artificial Intelligence Engineer

|  |  |  |  |
| --- | --- | --- | --- |
| **What is the difference?** | | | |
| **Chief Technology Officer (Jeremy)**  The main work of the Chief Technology Officer is making decisions for the overarching technology infrastructure that closely align with the organization's goals. | **Solution Architect (Brian)**  A Solution Architect is responsible for the design of one or more applications or services within an organization, and is typically part of a solution development team. | **Principal Data Insights Analyst (Shane)**  A Principal Data Insights Analyst uses data analytics to develop tools that provide clear, accurate and insightful information. | **Artificial Intelligence Engineer (Daria)**  An artificial intelligence engineer works with algorithms, neural networks and other tools to advance the field of artificial intelligence in some way. |
| **What is similar?** | | | |
| They need to have a deep IT knowledge and they should be aware of new and existing technologies and use their technical vision for a particular solution. | | | |

**Career plans comparison:**

Jeremy: “After finishing my bachelor’s degree, I am either thinking of doing a masters or moving into a degree in business. With these steps I am hoping it will lead me to greater opportunities of growth to then be in a CIO position in the next 8-10 years.”

Brian: “Skills and knowledge I will need to acquire are in the areas of engineering and software architecture design, cloud development and IT architecture. Obtaining positions with companies developing and working with cloud technologies will provide real world experience. Importantly obtaining a degree in IT will be an excellent start to filling these gaps in my knowledge, as well as further learning of AWS services.”

Shane: “My primary career interest is working in the area of higher management for a multinational corporation. With my current experience as owner-director of an international furniture manufacturing and export company, global property management and managing an international school, I feel that my personal on the job experience is suffice. In the modern-day, however, I do require more skills and actual “black and white” qualifications. For this reason, I am undergoing a Bachelor of International Business which I hope shall be acquired within the next three years.”

|  |  |  |  |
| --- | --- | --- | --- |
| **What is the difference?** | | | |
| **Shane**  Shane relies on his previous career experiences as well as on developing more skills and getting an actual “black and white” qualifications. | **Brian**  In addition to obtaining a degree in IT, Brian is planning to learn AWS server. | **Jeremy**  Jeremy’s plan is to do masters or move into a degree in business. | **Daria**  Daria is going to develop necessary skills using online courses. |
| **What is similar?** | | | |
| To achieve their goals, everyone needs to get the necessary skills and education, that will take several years. | | | |

Daria: “In parallel with studying at the University, I will be studying Machine Learning in Python using online courses. After mastering the essential skills, I can get an internship as a data science engineer. My next step is working as a data science engineer for several years to get an experience and then find a work in an international company as Machine Learning Engineer”

## Tools

G6 Internet Explorers Team website:

<https://g6-internet-explorers.github.io/>

G6 Internet Explorers Team Repository:

<https://github.com/G6-Internet-Explorers/RMIT-Assignment-3>

The G6 Internet Explorers Team utilised Microsoft Teams available through our RMIT Office 365 account to manage online chat and communications. We also posted links to relevant videos and websites within the chat so as to provide context rather than uploading these to GitHub. Through this same platform we also trialled the use of OneNote and Microsoft planner, which we ended up not using to a great extent. Our Team meetings were held through zoom teleconferencing software which allowed us to discuss and contribute in real time as if we were in the same office. Zoom also allowed us to record the session, which allowed anyone not able to be present to catch up at a time that suited them. Zoom, while providing screen sharing capability also allowed for keyboard and mouse control to be switched to other team members during a meeting.

I do not believe the audit trail on the Git repository accurately reflects our individual contributions, as decisions to create or update folders and text or upload word and excel documents were often made and actioned during our teleconference Team meetings. As such the audit trail will show the username of the person hosting the teleconference rather than the team member who created the content. Additionally, with the problem of GitHub invitations apparently being blocked within RMIT email systems and subsequent delay in providing group access it is incorrect to attribute the initial flurry of activity to any one individual, as with appropriate access others would have contributed equally.

# Project Description

## Overview

gardenMates is a subscription-based mobile application package that you can purchase, which assists in the development of small to large scale agricultural development. This application package comes with a sensor device that can be added to a pot plant, or larger devices for a vegetable bed, to capture environmental data. This environmental data includes moisture content, soil type, soil requirements, soil characteristics and weather information. The information provided gives the customer live-data and life cycle assistance to ensure plant development is met in the best of conditions. So that the end result is a thriving agricultural environment giving quality produce or enjoyment.

Outcomes

The outcome for this project would be that we have a robust, reliable working application and system to suit the novice at-home gardener and students then be able to expand on that technology to cater for large industrial vertical farms to increase their maximum capacity using a minimal carbon footprint.

### Motivation

Our motivation for pursuing gardenMates as a viable project stems from very real personal experiences of having pot plants, herbs and vegetables advertised as easy to grow, end up dead or ravished by insects or disease. Feedback from friends and relatives shows that this issue is not unique to us. Gardening can be very calming and therapeutic, less so when there are poor outcomes, so keeping plants alive for longer assists mental health. Having access to fresh herbs and vegetables is also important to physical wellbeing. The combination of a remote sensor an IOT device and a mobile phone application is very much on trend in I.T. terms with home gardeners and time poor city dwellers. We believe that our project, providing an innovative, cost effective, easy to use solution to gardening dilemma’s will provide a future employer with a better appreciation of our capabilities, problem solving abilities and exceptional team co-operation skills.

### Landscape

There are a lot of different plant devices, some of them are similar to gardenMates. For example, a device which is capable of measuring soil moisture, temperature, and light and automatically water your plant with the built in water pump. Or another one, self-contained automatic watering pot consisting of a soil sensor as well as the water reservoir built into a cavity in the pot.

There is a competition between automatic and non-automatic plant watering and monitoring systems. The most leading ones are PlantMaid and Parrot Pot. Garden Mates is quite similar to Parrot Pot but the distinguishing feature of it is a sensor device that can be added not only to a pot plant, but also to larger sized gardens making it available for micro agricultural projects.

Interestingly our research uncovered a kickstarter start up based in the U.K. that is almost a mirror of gardenMates. The main difference being their sensor is designed for indoor use only which is a limitation gardenMates intends to overcome. (Subscribe, 2019)

## Detailed Description

### Aims

The primary focus of the gardenMates project is to provide to the masses a technological assistant to assist in maintaining happy healthy balcony and indoor gardens. This will be achieved using a sensor that takes measurement of soil and location conditions. The sensor or sensors pair to a small hub which provides access to the internet and the gardenMates servers. The gardenMates servers are then able to feed a mobile phone application with notifications, tips and the sensor measurements for each sensor location.

### Goal 1

The initial requirement is a suitable sensor device. The sensor must be of rugged manufacture, waterproof and able to stand up to outside conditions as opposed to the competition which only provide indoor use sensors. Four different measurements are required.

* Soil moisture
* Soil ph
* Ambient light
* Ambient temperature

Requires either Bluetooth or ZigBee communication protocols.

### Goal 2

Of equal importance to goal 1 is the mobile phone application. This will allow sensors to be registered and named ie “Basil”, “Roses” etc and provide a visual representation on the application of the sensor measurements and general plant health. The application will have a small database to maintain local information and growing tips.

The application needs to allow for very easy wizard based configuration setups and sensor pairing.

### Goal 3

One major point of difference between gardenMates and the competition is the ability to monitor the plant/s and notify the user of plant wellbeing while the user is away from home for an extended time. This is made possible by providing cloud-based server technologies that receive information from the sensors even when the mobile phone is not in range. The cloud-based systems will also provide a plant library which will provide tips and tricks on keeping the plant healthy.

### Goal 4

Required for goal 3 to be successful is the ability for the sensors to communicate with the cloud systems irrespective of the proximity of the mobile phone. This requires a small powered hub that can communicate via Bluetooth to one or more sensors and Wi Fi to the home network to relay information to the cloud.

### Goal 5

Apart from having the right soil composition, moisture, with an appropriate temperature and sufficient light, other issues for plant health is disease and insects. It is important to be able to determine what is eating the plant or with what disease it is inflicted with. Both of which may spread to other plants nearby, so early diagnosis is key. gardenMates will have the ability to send a photograph of the afflicted plant to an AI housed within the gardenMates cloud servers and for that AI to determine through machine learning the most likely cause and to offer recommendations for treatment.

### Plans and Progress

The initial project

#### The Sensor

Initial investigation suggested that a 4 in1 sensor marketed as Huahuacaocao Flower Care Smart Monitor by Xiaomi would provide the functionality required. In fact it was the only commercial 4 in 1 sensor found. Initially the fact that this sensor only had Bluetooth communications caused some consternation as a point of difference between gardenMates and the competition is the ability to monitor plants (sensors) regardless of the proximity of the mobile phone app. This was resolved upon the discovery of a hub from the same manufacturer that offers Bluetooth, Wi Fi and ZigBee.

#### The Hub

#### Mobile phone app

#### Servers

### Roles

Several roles are required for the GardenMates project. These are as follows:

1. Chief Technology Officer / Product manager (position filled by team member Jeremy) – The role of this person is the know the total scope of the project from start to finish, inside and out. This person will oversee every aspect of the project and ensure that each component has been achieved to expectations. Most likely, the PM will be one of the team members and the individual for this position may change as the project evolves and if it takes different directions.
2. Developer – This position would be best suited to a software engineer. The primary responsibility for this position is to create the code, test the code on various devices and find any bugs.
3. Solution Architect (position filled by team member Brian) – to work closely with the product manager/ Chief Technology Officer, developer and designer to ensure the app functions as expected and to steer the design to have maximum business earning potential.
4. Designer – This person would be working closely with the Developer to ensure the interface of the app is easy to navigate and aesthetically pleasing and conforming with branding. The designer would also need to develop a logo and company colours/branding.
5. Machine Learning Engineer (position filled by team member Daria)– to develop the initial AI database that would be used in our app for diagnostics and advice received from the plant/soil data and user interface data when users are typing questions or uploading a photo of a sick plant.
6. Sales and Marketing and Customer Service – All team members would initially fill this position for our particular project, but down the track, as development goes farther, we would need a tech-savvy team with excellent communication skill to take the position full time looking after customers, reporting bugs to the team, moderating forums, organising advertising and promoting upgrades with offers and subscriptions.
7. Principal Data Insights Analyst (position filled by team member Shane) – to be continually monitoring that the application is functioning in a profitable way. To identify cost saving and other potential earnings. This person would also pinpoint where the project has room for expansion and establish the applications strong and weak elements.

### Scope and Limits

An integral part of the gardenMates project is the sensor and we are pleased to have been able to source a commercially available one that should be sufficient for most balcony gardens.

Paired with the sensor is a hub from the same manufacturer which will provide a link between one or more sensors and the gardenMates servers.

The mobile phone app is in the UI design stage and a mockup is included in this report.

The database chosen to provide server and mobile phone synchronisation is CouchDB, an open source NoSQL database from Apache.

Hosting will be through Amazon AWS.

Options for AI and machine learning are being explored

AWS also offer IoT services.

An api to connect to open source plant libraries and databases is being researched.

### Tools and Technologies

**Mobile app (IOS, Android):**

**Technologies:**

* Mobile app prototype - demonstrates how a product will function. The purpose of a prototype is to communicate a product’s design and navigation flow to maximize the efficiency of development.
* IDE - an integrated development environment is a software application that provides comprehensive facilities to computer programmers for software development.
* Coding language – development programming language.

**Mobile app prototype:**

Mobile App Prototyping Tool – Sketch. Sketch is a lightweight tool with a simple interface, leaving designers free to focus on the task at hand. It enables the user to transition seamlessly between design screens (artboards), add animations, and create working prototypes with a couple of clicks.

$99 for full version

**Android app:**

IDE - Android Studio. Android Studio is an Android development Software built by Google. Its implementation editor is very useful for Android developers. Android studio provides shortcuts for coding and designing and its layout designer makes it very easy to use, which helps reduce time spent on coding. Android studio also provides drag and drop features to design the layout of your projects. It is a free software.

Language – Java/Kotlin.

For play market publication need a Google Play Developer Account - $25 (pay the one-time)

**IOS app:**

IDE – Xcode. Xcode is one of the best IDE for iOS app development that features automatic completions and full syntax highlighting for Swift. It is integrated with the Cocoa Touch frameworks. It has an assistant button which splits the editors into primary work document & the assistant editor.

Language – Swift.

For Appstore publication need an Apple Developer Account - $99 (annual fee)

Another important step is to buy **GitHub private account** - $9 per month

**Backend:**

**Technologies:**

* Coding language - development programming language.
* A database - is an organized collection of data, generally stored and accessed electronically from a computer system. Where databases are more complex they are often developed using formal design and modeling techniques.
* Frameworks – is a software library that provides a fundamental structure to support the development of applications for a specific environment.
* Cloud hosting - is the process of outsourcing an organization's computing and storage resources to a service provider that offers its infrastructure services in a utility model.

**Coding language:**

Python - is an interpreted, high-level, general-purpose programming language. The main language of AI and ML. With its strong process integration features, unit testing framework and enhanced control capabilities contribute towards the increased speed for most applications and productivity of applications. It is a great option for building scalable multi-protocol network applications.

**Database:**

Apache CouchDB - is an open source NoSQL document database that collects and stores data in JSON-based document formats. Unlike relational databases, CouchDB uses a schema-free data model, which simplifies record management across various computing devices, mobile phones, and web browsers.

**Framework:**

Django - is a powerful and flexible toolkit for building Mobile App.

TensorFlow - is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library and is also used for machine learning applications such as neural networks. It is used for both research and production at Google.‍

**Cloud hosting:**

Google Cloud - is a provider of computing resources for deploying and operating applications on the web. Its specialty is providing a place for individuals and enterprises to build and run software, and it uses the web to connect to the users of that software.

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##### Hosting

Amazon EC2 instance for database

##### Software

Turnkey couchdb server

### Testing

### Timeframe

### Risks

### Group Process and Communication

We have found that communications have been as per previous assignment, very smooth and productive. The tools we used mostly were Microsoft Teams and Zoom Cloud Meeting. Our team members would poll for a time that was suitable for everyone and fortunately we would all be able to come together once per week.

This assignment however our communication was slightly different to the last one as previously our assignment was taking place over Christmas and New Year. This assignment however was more demanding on communications for us as the majority of our team members had to return to demanding work commitments and some members were dealing with getting children back to school or returning home from holidays.

Most often during our cloud meetings we would close by agreeing on a time for the next meeting. In the beginning once tasks were divided it would we would meet once a week but towards the final three weeks, often enough we would try to meet every three days to check on each other progress or assist each other if there were difficulties.

Our team agrees that because this was a new project, ideally to meet in person at a conference table and sketch the plans, our ideas and notes on a whiteboard would of certainly been the most effective. Communicating via web conferencing once the project is up and running is fine, but the initial in person meeting would unquestionably have gotten us started of much smoother.

We did not have any group members not responding other than the two members as previous assignment that were uncontactable. It was easy to see via Microsoft Teams that members were checking messages at least once a day and being involved in the discussions and problem solving. As per previous assignment, we had already agreed that if for some reason a member was not responding, the tasks would be divided up and each member would volunteer to take on the task.

### Skills and Jobs

Manager

For such a detailed project that spans multiple technologies, cloud computing, software and hardware, the most appropriate

Team Member 1

Team Member 2

Team Member 3

Team Member 4

## Group Reflection

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