19th July 2020

[Really impressive title here]

[Document subtitle]

Contents

[Team Profile 2](#_Toc45890833)

[Personality Tests 2](#_Toc45890834)

[Ideal Jobs 3](#_Toc45890835)

[Industry Data 4](#_Toc45890836)

[IT Works 5](#_Toc45890837)

[Report here (rename) 5](#_Toc45890838)

[Transcript (should we just leave this as a separate appendix on the website?) 6](#_Toc45890839)

[IT Technologies 9](#_Toc45890840)

[Cybersecurity 9](#_Toc45890841)

[Autonomous Vehicles 12](#_Toc45890842)

[Technology 3 14](#_Toc45890843)

[Technology 4 14](#_Toc45890844)

[Project Idea – Aquarium Climate Control System 15](#_Toc45890845)

[Overview 15](#_Toc45890846)

[Description 16](#_Toc45890847)

[Development in Assignment 3 18](#_Toc45890848)

[Group Reflection 18](#_Toc45890849)

[Members 18](#_Toc45890850)

[Summary 18](#_Toc45890851)

[References 19](#_Toc45890852)

# Team Profile

## Personality Tests

### Joe

#### student ID: S3862471

I first became interested in programming when I had to do an assignment on [BASIC](https://en.wikipedia.org/wiki/BASIC) in year 9 in high school, which led to my talking my parents into buying me a [Dick Smith System 80](https://www.classic-computers.org.nz/system-80/hardware_s80.htm) with 16kB RAM and an audio tape drive. I started programming in BASIC on it, writing various games and working on one in particular that helped me learn about subroutines.

In 1982 I finished a year student exchange program in the USA where I studied BASIC and got 100%. I did a course in [Pascal](https://en.wikipedia.org/wiki/Pascal_(programming_language)) in 1983 and started a degree in Mechanical Engineering at the [University of Technology, Sydney](https://www.uts.edu.au) (UTS, then the NSW Institute of Technology) in 1984 where I learned [Fortran](https://en.wikipedia.org/wiki/Fortran) and dabbled in some other programming languages ([Ratfor](https://en.wikipedia.org/wiki/Ratfor" \t "_blank), [Z80 Assembly code](https://rosettacode.org/wiki/Category:Z80_Assembly), [Forth](https://en.wikipedia.org/wiki/Forth_(programming_language))). I had to withdraw from the course before I finished. In 2010 I had another go at Mechanical Engineering, at [Sydney University](http://sydney.edu.au) this time. In first semester I did Engineering Computing which covered [Matlab](https://au.mathworks.com/products/matlab.html" \t "_blank). September last year I had to withdraw from the course having completed 89% of it. I have some experience in [HTML](https://en.wikipedia.org/wiki/HTML) and had a web site which made use of HTML and [CSS](https://en.wikipedia.org/wiki/Cascading_Style_Sheets) but that is gone now. I also started a course on Udemy in writing applications for [iOS](https://en.wikipedia.org/wiki/IOS), but I didn't complete it as I prioritised my university studies.

#### Meyers-Briggs Test

[<https://my-personality-test.com>]

(E)xtroverted: 24%

(S)ensing: 6%

(T)hinking: 16%

(J)udging: 54%

#### Learning Style Test

[<http://www.educationplanner.org/students/self-assessments/learning-styles-quiz.shtml>]

Auditory: 60%

Visual: 25%

Tactile: 15%

#### IQ Test

[<https://intellitest.me/en/knowledge/FKEVK/start?gclid=CjwKCAjwt-L2BRA_EiwAacX32ZGDJ42BbvUPAbsiDCjgF3JoYrXkph9bF-tWF1AR5aZmPr57oNZvGBoCgiMQAvD_BwE&utm_campaign=9910358&utm_content=free+iq+test+online&utm_medium=gad_as-1_us-uk-ca-au_pho-tab-web_40q_iq_int&utm_source=62>]

Your IQ score is 130

While I don't disagree with the description of myself that the Meyers-Briggs Test comes up with, I'm not sure how useful they are for someone who knows themself well. They may be helpful to someone hiring people who has to assess a lot of people they don't know quickly, or for a young person who doesn't know themself that well. It's pretty positive so I don't think it's a problem for job interviews if they test me. The learning style test doesn't really tell me anything I didn't already suspect. IQ tests suffer from problems of cultural bias, although this works in my favour as I am of the culture the tests are aimed at.

For a group it indicates I should be an asset to them. Being organised and natural leader, combined with my experience with HTML and programming should make it easy for me to find people who would like to join forces. I hope to be able to help the team out a lot. Although my ESTJ profile says I'm a natural leader, this is not a position I gravitate towards as it takes a lot of work to do well. All the groups I've been in at university before didn't have a leader and just worked cooperatively anyway.

### Marcus

#### student ID:

Text here

### Murray Lowis

#### student ID: S3862651

My IT experience to date has been mostly from simply playing around with my own computers and limited free online courses. When it comes to technology, I use I like to explore and test everything I can, whether it be learning new programs or trying new ways to use gadgets. For instance, streaming my computer to the living room then using a Bluetooth PS4 controller with 3rd party software to watch Netflix, or myriad other token exercises.

#### 16Personalities:

(I)ntroverted: 96%

I(N)tuitive: 71%

(T)hinking: 64%

(P)rospecting: 58%

(T)urbulent: 56%

#### Learning Style Test:

Reflector: 90%

Theorist: 75%

Pragmatist: 40%

Activist: 40%

#### Big Five Personality Test:

Openness: 51%

Conscientiousness: 29%

Extraversion: 1%

Agreeableness: 46%

Reactiveness: 47%

[Myers-Briggs personality test

16Personalities, "Free Personality Test," 16personalities.com [Online]

Available: https://www.16personalities.com/free-personality-test

Accessed: 17/06/2020]

[Learning Style Questionnaire

Mint Human Resources, "Honey and Mumford Learning Style Questionnaire," mint-hr.com [Online]

Available: https://www.mint-hr.com/mumford.html

Accessed: 17/06/2020]

[Big Five Personality Test

123Test, "Personality Test," 123test.com [Online]

Available: https://www.123test.com/personality-test/

Accessed: 17/06/2020]

These personality test results suggest suitability for analytical or creative roles rather than more arduous or repetitive tasks. Developing the project idea and designing the website HTML and CSS elements both require creativity and the website design additionally requires an analytical approach. On these grounds as a group we agreed that I would primarily work on setting up the GitHub website and developing the “Project Idea” section. My introversion also meant that the interview could be better handled by others.

### Ossama

#### student ID:

Text here

### Torin

#### student ID: S3863563

### Myers-Briggs Personality Index:

(I)ntroverted

I(N)tuituve

(F)eeling

(J)udging

#### Learning Style Test:

Auditory: 40%

Visual: 45%

Tactile: 15%

#### Big Five Personality Test:

Open-Mindedness: You enjoy having novel experiences and seeing things in new ways.

Conscientiousness: You are well-organized and reliable.

Extraversion: You are extremely outgoing, social, and energetic.

Agreeableness: You find it easy to express irritation with others.

Negative Emotionality: You aren't particularly nervous, nor calm.

After taking these tests I can see how they might be helpful within a group setting. Firstly, noting a group member’s extroverted disposition could aid in the decision to promote them to a leadership role, though identifying this would be easy on the initial interaction with said member.

The second most helpful metric to analyse is the turbulence between the tests. While one of my tests reads extroverted, another reads the opposite. This may indicate one of two things, a dubious nature in the group member or misaligned testing criteria. In any case, lending credence to these tests is difficult with such drastic swings in results.

### Tyson

#### student ID:

Text here

## Ideal Jobs

### Joe

Text here

### Marcus

Text here

### Murray

In assignment 1 I stated that I am interested in programming and cybersecurity as potential careers. My opinion has remained mostly the same although I do find myself enjoying the programming side of things.

In relation to the other members in the group, the most similar ideal jobs would be Joe’s or Torin’s as we all seem interested in software development in some form. They do still differ however in that my interest is more to do with the actual creative design process as opposed to working toward a particular outcome for instance.

### Ossama

Text here

### Torin

Upon reading the different ideal jobs from each of the group members I can see the varied paths we wish to take within IT.

Marcus and Joe both chose paths that are centered around using technology to assist people who are disadvantaged.

Both Tyson and I chose paths that require a varied skill set, overseeing and combining each aspect to attain a common goal. Murray’s ideal job stresses creative freedom and pragmatic application of his work. This is congruent with Ossama’s ideal job scenario.

Each of the group members wishes to have some degree of practicality in their job, although some wish to look at the bigger picture rather than being on the frontlines of their workforce.

### Tyson

Text here

# Industry Data

### Joe

Text here

### Marcus

Text here

### Murray

According to Burning Glass (reference needed) my ideal role in software development/engineering is currently among the most in demand within the IT industry. While the specifics vary depending on the nature of the platform as well as the ultimate usage, there appears to be a great deal of variety in suitable roles available.

Preferring to be involved in the physical development of software (as opposed to managing or guiding projects) does somewhat lower my career ceiling though as senior roles tend to move farther away from actual development and more into oversight. A lower ceiling does at least mean more attainable goals and greater flexibility provided I can maintain a diverse skillset with multiple specialisations.

Expertise with multiple programming languages and problem solving/organisational skills are among the most demanded skills which suits me quite well as I intend to make these a staple of my skillset. Active communication and diligence are potential areas for improvement, as to me these have always been more an obligation than a focus.

### Ossama

Text here

### Torin

Text here

### Tyson

Text here

# IT Works

## Report here (rename)

Text here

## Transcript (should we just leave this as a separate appendix on the website?)

Could you please tell me about your IT work, what industry you work in, and what exactly you do?

I work in the IT industry, specifically at the moment I’m in the IT department at Pizza Hut, and my job role is the web developer. I work on the front end of Pizza Hut’s forward-facing web site, as well as a few backend related tasks and some private facing websites for the company.

Can you tell me who you work with mostly, is it mainly IT people or other people, and what sort of IT people do you work with?

For the most part I work with the IT team, my co-workers, which currently consists of a DevOps person, a Systems Architect who mostly decides what systems we will be working on and maintaining for future projects, a backend developer, and then a data management team. So that’s the main people I work with. Also every two weeks we hold meetings with the marketing team to demo what we’ve done and the features we’re providing, and we work closely with them about what they want to see on the web site. So they’re the main two, we occasionally work with the finance team when we’re working on financial systems to make sure everything’s running smoothly. A few departments but mainly I work with IT and the marketing team.

What sort of work do you have to do?

So the majority of the work involves implementing new features on the web site, so whenever a request comes through from marketing or my superiors I develop those features on the web site, as well as tests to go with those features and unit tests. That would usually be on a Javascript framework. ViewJS at the moment is the framework we use, which I am specialised in. Occasionally I work on the backend which runs an AWS service which uses some C# code. So we manage a set of APIs on the web site, so I’ll develop on the front and I’ll develop a set of APIs which the front end will require on the web site, so whether that’s a product management API or an order system API or whatever is required on the front end to communicate with our back end systems.

What’s it like to work with the IT people?

My experience at Pizza Hut has been overall positive, I’ve been very lucky to work there. As a university student myself I started out there as a junior developer in sort of an intern position just learning the ropes. I had a mentor who showed me how certain things worked. Very lucky, and the set of systems they’re dealing with, working with Amazon so it’s a very modern system they’re working with on a day to day basis so I get to learn new technologies which I can use in a future job, so in that I am very lucky to work with them. Getting to work with enterprise business is a real eye opener for if I want to continue down this job line in future. Covid-19 has made things quite interesting with working in the office making it all remote work. We did work from home a couple of days previously so the adjustment to that has been easier than for some of the other departments. We work it out with our major communication device being Slack where we hold meetings through that now.

What’s it like to work with the marketing people?

It can be interesting (laughing). I won’t say anything bad about them but they keep us on our toes. Occasionally I will be directly contacted by marketing for things they want to see on the web site since they know I’m in charge of it. We try to keep things to a system so that if they request something on the web site it goes through a product owner who creates a ticket which will get estimated by the team of how much work is involved, then it gets assigned to either me or one of the other developers. That’s the proper process so whether it sticks like that or not changes, but we try to meet their needs in a systematic approach so that things get deployed on time and meet certain goals, so yes it’s interesting working with them. The IT team sticks to an Agile methodology while the marketing team has their own practices which don’t always align themselves with how we plan our sprints or assign tasks so a marketing requirement might have a feature come up on the same day that they require to be implemented the next day or within that week so that’s where systems kind of clash between departments, but we come to a bit of an understanding of each other’s systems and a bit of compromise.

What do you spend the most time on?

It can change day to day, week to week. Some weeks we spend most of the time cracking down on bugs on the web site that our users or the marketing team or our own team have found. Time can be invested in investigating that bug, in where the issue lies, fixing it and developing the relevant tests so that bug doesn’t show itself in the future so that we don’t have any regressions on the web site. So that can be very time consuming. In an ideal world I’d spend most of my time creating new features on the web site, whether that is a new payment system like Google Pay or Apple Pay, or making a better user experience on the web site, so slightly tweaking things on the web site that we think will give a better user experience, or implementing order history so making it that you can access that order history through the phone or through the web site, so the majority of my time I spend on the web site fixing bugs or implementing features.

What do you find the most challenging? Is it the debugging?

Debugging can be challenging. It’s still a learning experience with finding the best ways to catch certain bugs beforehand, or for them never to appear in the first place. Recently I implemented an error catching system on the web site which catches errors users find on the web site in real time and reports them back to us. It then helps us find what line of the code the bug may have occurred to and who may have committed it to our repository so we can send someone to investigate and fix that. So debugging can be the most challenging part of my job and especially high priority bugs. Also learning new technologies the business requires and working with other third party businesses to implement those technologies, so Google or Apple, and some of the time zone differences between those people can increase communication times so that deadlines can be missed, so I can send an email during the day and it will take 12 to 14 hours for them to get back to me and the same happens again so working with other businesses with new technology can be one of the most challenging things. Challenging but rewarding when you fix that bug and learn from your mistake or meet new people and contacts through these new businesses and learn new technologies.

Can you give me an example of something in your work that you feel encapsulates the IT industry?

I can think of some of the large things I’ve worked on that other IT companies would have done as well. There was implementing a content management system so that marketing can make changes to the web site themselves, which other companies would have to do for their clients as well. A majority would have used Wordpress but if you have a custom platform you have to implement a custom solution, so making sure marketing requirements are met and also good practices are followed with what exactly can be managed. That was one of the projects I worked on which was interesting and challenging but ultimately provided a lot of value to the company.

[probably need to reference this guy’s name etc.]

# IT Technologies

## Cybersecurity

### Overview

Information Technology is an ever-increasing presence in our lives today. The reach of modern technology reaches into almost every facet of our lives. We use it to surf the web, access our money, talk to our family, and store valuable information, but how safe is our data? According to COS online “attacks on Internet of Things devices **tripled** in the first half of 2019” (https://bit.ly/2Zoab6l). As our reliance on technology grows, so do the ways hackers and criminals can find ways to exploit our private data. While cyber-attacks are on the rise, companies in the cybersecurity sector are creating and implementing technologies to resist and combat their advances.

### Phishing and AI

Phishing is a type of scam that involves tricking the targeted individual or group, such as a business’s workforce, into voluntarily installing malware or ransomware onto their device. Once the malware is installed the scammer can do as they please with the information stored or connected to those devices. Phishing scams are commonly delivered through an email, disguised as important and valid information, which makes phishing so hard to defend against. “According to Verizon’s 2019 Data Breach Investigations Report, nearly one-third of all data breaches involved phishing in one way or another.” (https://bit.ly/2AhO3lo). This makes phishing a top priority in cybersecurity. US Security company Area 1 (https://bit.ly/2CZCtfV) has been implementing AI technologies to oppose phishing scams. The company, founded by 3 former NSA employees, uses their cloud-based ‘Horizon’ software to monitor and detect anomalous language, banners, and attachments. A deeper look into Horizon reveals machine learning capabilities and a small pattern analytics engine known as SPARSE. This engine aggregates the entire web and characterises patterns in phishing attacks. In conjunction with their web-crawling service ActiveSensors, phishing is detected early and neutralised before any malware can be installed on the victim’s system. The beauty of AI is, as the collected data Area 1 obtains grows, profiling a cyber-attack will become faster and more effective, leaving businesses, employees, and individuals safer to the threats of web use.

### What is the likely impact?

The impact of AI will likely be felt in the next decade as data breaches continue to grow and phishing attacks become more sophisticated. According to a report by the Capgemini Institute, companies are starting to look to AI to aid in protecting their systems. “Overall, close to three-quarters of firms (73%) said they were testing use cases for AI for cybersecurity in some way.” (Capgemini, 2019). While still in its infancy, machine and deep learning technologies like SPARSE and ActiveSensors are the beginning of the push back against phishing scams and data breach activities. Large companies with sensitive information, such as banks and financial institutions will benefit from advancements in AI the most. Due to the pace in which cyber-attacks mutate, security companies who lack the foresight to update their software regularly will surely fall behind. Implementing AI will be the marker of successful enterprises of the future.

### How will this affect you?

While the main demographic of sophisticated security technologies are businesses that protect valuable information, individuals will feel the effects too. The anti-virus software on personal computers will begin implementing similar strategies in defence against phishing attacks. The inner workings of these updated security protocols will likely go unnoticed by the average user, though it will allow a more detailed review of the threats which have been extinguished. Email users will feel safer navigating their inbox, resting easy knowing any potential threats will be highlighted and dutifully wiped out.

### Private Browsers and VPN’s

Browsing the internet can be relaxing, entertaining, and everywhere in between. Though with the rise of cyber-attacks on internet users, several companies have developed technology to remain anonymous, therefore guarded, whilst browsing the web. The most common of these is the Virtual Private Network or VPN. A VPN works by rerouting the user’s IP address and presenting a new one to whoever might be trying to identify them. Certain top-tier VPN services such as NordVPN use an encryption layer to further protect the information being transferred. VPN’s provide a simple and cost-effective way of ensuring privacy online and users are starting to take note. According to Dataprot “26% of internet users worldwide have used a VPN service.” (https://bit.ly/2NKrokP). As this number grows so do ways of circumnavigating the technologies. In March 2018, a hacker managed to briefly infiltrate a NordVPN server. While the company assured there was no identifiable information leaked to the attacker, they may have been able to observe the server’s traffic. In theory, VPN’s should make the user anonymous as they surf the web, however, they are not without their limitations.

To create a fully secure browsing experience, internet users may have to look further than VPN’s to be confident in their anonymity. Products, such as Google’s Chrome browser, are data mining machines. While using any of the largest browser services, the internet user can be sure their data is being recorded and monitored. The solution to this is The Tor browser.

Tor or ‘The Onion Router’ boasts “the largest, most robust, and most effective metadata-resistant software project” (https://bit.ly/3ghc1gc). Tor’s software bounces the user’s internet traffic through three layers of randomly selected nodes, obfuscating the identity of the user. Ethically, Tor has received some scrutiny for allowing individuals to remain anonymous while undertaking criminal activities. As Tor’s FAQ states “Criminals can already do bad things. Since they're willing to break laws, they already have lots of options available that provide better privacy than Tor provides. Tor aims to provide protection for ordinary people who want to follow the law. Only criminals have privacy right now, and we need to fix that.” (https://bit.ly/31KAZk6).Tools such as these endow the average internet user anonymity and security, a practice that is ever necessary for the tech age.

### What is the likely impact?

Developments in private browsing are already in effect. An increase in people signing

up for VPN services and privacy tools shows the public’s focus is on anonymity online. Software, which tracks and records information such as Google’s entire suite of programs, will slowly be replaced with a private and tracker free counterpart. Already, the private search engine DuckDuckGo has seen its search traffic almost double between 2017 and 2019 (https://bit.ly/31V8rEw) and is expected to continue this trajectory into the future. Work in creating anonymous systems will begin to grow as private browsing becomes the new norm. Those companies who rely on data collection will likely see a loss in customers as competitive privacy conscious companies are born and evolve.

### How will this affect you?

This will affect the way common people browse the internet. Instead of loading Chrome Browser and searching for Facebook, people will ensure their VPN is active, before loading a private browser such as Tor and using DuckDuckGo to search for their query.

The average user will be hypervigilant in protecting their system to any potential trackers or websites hoping to spy on their activities. These programs are soon becoming the lens, through which we see the wide web.

## Autonomous Vehicles

Autonomous vehicles are vehicles that don’t need a human to manually drive it. They operate by “leveraging various integrated technologies, including but not limited to artificial intelligence, sensors, big data, IoT connectivity, and cloud computing” [Siemens Digital Industries Software n.d, Autonomous Vehicles (AV), viewed 14 July 2020, <https://www.plm.automation.siemens.com/global/en/our-story/glossary/autonomous-vehicles/46607>]. Essentially, driverless cars are “designed to be capable of 3 things”: sensing, thinking and acting.

Years ago this would have sounded ludicrous, however in recent years there have been astronomical improvements in the world of autonomous vehicles, so much so that you can actually buy a car that is in stage 3 of automation already.

There are essentially 6 ‘levels of automation’ [English, T 2020, ‘The Future of Autonomous Cars Is Bright’, Interesting Engineering, viewed 14 July 2020, <https://interestingengineering.com/the-future-of-autonomous-cars-is-bright>] on the road to being fully driverless.

1. No automation
2. Driver assistance
3. Partial Automation
4. Conditional Automation
5. High Automation
6. Full Automation

Stage 1 involves no automation at all. Everything from winding the windows up and down to shifting the gears was all done manually.

Stage 2, or ‘driver assistance’ includes a small amount of assistance with things such as steering and braking. We are now past this stage and have moved mostly into stage 3.

Stage 3, or ‘partial automation’ is our current stage within society. There are several automated functions such as parking on their own (in some cars) and some cars can even drive on their own for a period on highways, as seen with Tesla’s autopilot function.

Stage 4, or ‘conditional automation’ is the next stage of automation that we have yet to reach. This is where all driving functions are autonomous, however you can still take over the steering wheel.

Stage 5, or ‘high automation’ is where there is no driver necessary and the car work fully on its own.

Stage 6 involves full automation with no driver’s seat and no steering wheel.

I think within the next 3 years, especially now with covid-19 continuing to slow the economy, autonomous vehicles may take a back seat. The next stage is for all driving to be automated within a car, which has already been attained by several technology companies across the globe. However, the hardest thing for these companies to make an impact will be for them to try and obtain consumer trust.

That is the biggest test for autonomous cars. Consumer trust. Even though there is resounding evidence that majority of deaths associated with cars is human error, people are still very hesitant to put their trust in technology.

The further development of autonomous vehicles will be astronomical. There is so much potential in self driving vehicles, now more than ever. Lives will be saved through the elimination of human error on the roads, quality of life for the elderly will increase exponentially due to them now having access to driverless cars to get around and the economy in general will benefit.

You may even be able to be on your phone while ‘driving’ or have a beer and not be a danger to society. This is a world I want to live in!

There may however be negative affects to this situation. There are people who believe that there are “ethical and psychological concerns about their behaviour in critical, non-routine traffic situations that potentially involve fatalities” [Frank, D-A, Chrysochou, P, Mitkidis, P & Ariely, D 2019, ‘Human decision-making biases in the moral dilemmas of autonomous vehicles’ Nature, viewed 16 July 2020, <https://www.nature.com/articles/s41598-019-49411-7>.]. For example, what is an autonomous vehicle going to do when faced with a decision hit a 4-year-old child or a 65-year-old man? Every person is different, but it poses the question. What is the right answer? This is the greatest steppingstone that these researchers and companies need to figure out.

People most affected by this will be people who drive for a job, truck, tram, taxi drivers among them. These are jobs that will now be replaced or made redundant; however, it may also create jobs as well.

Jobs in the technology industry will increase as more and more IT specialists will be required by car manufacturing companies who want to compete. IT is and will be a huge part of our future and so jobs in this field are only set to grow from any technological advances into the future.

This will not affect my day to day life at all. I hardly drive at all as I live in a small country town and work 2 minutes away and so this will not affect me for some time. However, several family members live and work in the city and so for them life will change drastically.

Soon enough, for people living in urban areas, the number of autonomous vehicles on the roads will increase essentially giving people more time in their day to work or play. Trams will be automated and so will trains. Travelling long distances to visit family and friends will be much more enjoyable and easy once vehicles are autonomous.

I feel there are 3 main things to take away when thinking about autonomous vehicles:

Safety – we know that many deaths on the roads are caused by human error which may be eliminated with autonomous vehicles and make our roads safer than ever.

Convenience – for most people, driving is a chore. We aren’t excited about getting in the car but we do it because it’s the easiest way to get to and from work. If we no longer have to drive the car and we are essentially another passenger, think of the things you can do on the way to work now that you once could not. Do your makeup, catch up on the morning news, watch your favourite tv show. The possibilities are endless.

Cost – autonomous vehicles will be expensive. There’s no doubt about that, in fact in my opinion most of the population won’t be able to afford one of these automated vehicles for quite some time.

## Technology 3

Text here

## Technology 4

Text here

# Project Idea – Aquarium Climate Control System

## Overview

While there are many unique ways to successfully maintain an aquarium, there are even more ways to poorly maintain an aquarium. Poor maintenance leads to unhealthy tank conditions and stress, sickness, or death for its inhabitants.

One of the main causes of poorly maintained tanks is user ignorance. Very often aquariums become unhealthy simply because its carer does not understand the needs of their tank, introduces incompatible tank mates, or does not have the means to conduct proper maintenance. Another cause of poor conditions is the sheer effort often required for proper maintenance.

‘Green water’ caused by ammonia build up and excessive lighting [ref number here]

Green water image

Myabi Aqua Design Ltd, “The War on Algae,” European Telecommunications Standards Institute, ETSI-TR-101, 2007. [Online].

Available: <https://www.miyabi-aqua.com/tips-and-techniques/the-war-on-algae>

[Accessed: July 17, 2020]

Our group project idea is to develop a climate control system for household aquariums to mitigate these problems.

This climate control system would incorporate several mechanisms and sensors working in tandem to gauge and maintain the biological health of an aquarium, as well as interactive software to provide relevant information to the user. These would all be connected to a central control hub directly controllable by the user.

This system would allow a degree of independence for the tank by automating many responsibilities and otherwise advising the user when their direct intervention is required. This will greatly ease the workload and streamline maintenance.

As a starting point, the physical system would support multiple variants of the following types of instrument:

o Animal/plant feeders

o Heaters

o Thermometers

o Filters

o Lights

o Timers

o Water level monitors

o Controllable water reservoirs

o Aerators

o Chemical concentration monitors

o Chemical release instruments

A modular design would mean that support for additional instruments could be added as they are conceived.

These components would be interchangeable as necessary to maintain parameters set by the user based on the specific needs of their tank and the desired degree of automation. Integrating these modules into a universal control hub will allow a tank to manage many parameters independently and otherwise provide feedback to the user when their direct intervention is required.

Supporting these instruments would be a digital encyclopedia built into the hub device. This would detail requirements for various species and guides for proven aquarium strategies. This would provide all the information up front to a user allowing them to make informed decisions about what livestock their existing set up can support, as well as how to manage the system once it is up and running. Alternatively, the guides could be used to instruct new aquarium set ups based on proven techniques.

This project would improve the capability of novice aquarium owners to maintain healthy tank conditions. Automating many of the manual obligations in conjunction with the information provided by the app would also enable them to try some of the more complicated types of aquarium builds.

For more invested enthusiasts, the automation would help to save time on the more menial tasks such as regular manual testing and allow them to focus more on the more exciting aspects of the hobby like aqua-scaping or breeding. It will also help mitigate deterioration when other obligations get in the way of tank maintenance. The app could also be used as a source of inspiration for new and interesting aquarium ideas.

## Description

This project is built around two primary components: the physical hub onto which all the other instruments would be connected, and the encyclopaedic software to allow the user to plan/manage their aquarium and provide feedback on tank conditions.

The hub would be a custom-built computer with several multipurpose ports to allow for the docking of the different physical instruments. Modules could be bundled with hub or come separately depending on the nature of the set up the user desired.

The instruments themselves can be classified into two main categories: standard and specialised. Standard modules would include the likes of lights, heaters, and aerators that either perform a constant operation or could be operated simply with an on off switch. While complex higher functions would be possible for some of these, for simple usage scenarios they could be interchangeable with any 3rd party alternative.

Specialised modules would include those with more complicated functions such as water chemistry monitors/control mechanisms and mechanical reservoirs. These would require greater input from the control hub based on measurements from the other instruments for proper operation.

Animal and plant feeders would also function quite simplistically via timers. These would be configured to release defined portions of either solids or chemicals stored in refillable containers.

### Standard Instruments

The most fundamental modules would be heaters/thermometers which should generally be included in most aquariums in some form. Heaters will need to be made available in different sizes/wattages to suit tank dimensions and ambient temperature. Different types are also possible (suspended heating elements, underground heat mats etc.) depending on cosmetic preference, affordability, tank requirements etc.

Filters are generally the next most fundamental component, used to maintain water quality. It is possible in more advanced set ups to omit a mechanical filter provided the tank is otherwise biologically filtered through heavy plantation and bottom feeding livestock like shrimp, snails, or catfish. More complicated filter usage scenarios are detailed under specialised instruments.

Basic aerators can typically be configured once and left to operate indefinitely. Whether it be an air-stone creating bubbles that rupture at the water surface or a continuous waterfall (which can be combined with a filter), these generally work through the same principle of agitating the water surface to entrain oxygen.

Basic lighting is very commonly used to accentuate aquariums, however full spectrum lighting is essential for planted tanks to sustain plant growth. These can be paired with timers to set appropriate intervals to maintain balance between plant growth, limiting algal blooms, and aquarium aesthetics at peak viewing times throughout the day. Wattage and active schedule could be adjustable depending on the dimensions of the tank and species housed.

### Specialised Instruments

More advanced filter usage could be regulated by the hub via timers and sensor readings to toggle the filter on and off or limit flow rate depending on water hygiene. Keeping filters off when not needed will help maintain food supply for plants and bottom feeders.

Automated water reservoirs or ballast tanks could be combined with water level sensors to account for evaporated water and maintain the water level. While far from compulsory, such systems would reduce the workload associated with manual water changes and top ups. It would also be possible to tie these mechanisms in with the outlets for filters/aerators.

It would be possible for water chemistry parameters such as pH and water hardness (dissolved minerals) to be monitored with appropriate sensors. These could then be either regulated with motorised chemical release systems or otherwise the data provided as feedback to the user for manual intervention.

### Software

The hardware would all be built around the universal hub which would operate on custom made software. The hub itself would need to be able to take direct input from the user to control its functionality and provide feedback which could be done with interactive touch screen technology.

This software would need to be able to process inputs from the user and various sensors to control the relevant instruments and automatically adjust aquarium conditions. It would also need to be configurable to different combinations of instruments due to the modular design.

In addition to controlling the physical components of the system, the hub would also be programmed with an expansive encyclopaedia covering species’ habitation requirements and tank mate compatibility. It would also contain stencil guides for various proven set up methodologies which can then be tailored to suit the needs of the intended inhabitants and user preferences. These would range from simple light, heater, and filter systems to near autonomous systems using every one of these modules.

It would also be possible for a version of the encyclopaedic component of this software to be made available as a companion smartphone app or computer program.

## Development in Assignment 3

While the construction of the physical components would currently be beyond the capability of our team and would need additional tools and expertise, we would certainly be able to start developing the software to control the hub.

Specifically, we may be able to program simple operations for the control hub to take inputs from the sensors and output commands to the various modules. We would also be able to start compiling the user interface and encyclopaedia for a limited number of species and aquarium set up guides.

For the physical components we would likely be able to at least come up with some generalised designs and determine how they could be incorporated into the overall build. We would be able to account for such design choices as water proofing, component orientation of devices and other cursory considerations.

# Group Reflection

## Members

### Joe

Text here

### Marcus

Text here

### Murray

Text here

### Ossama

Text here

### Torin

Text here

### Tyson

Text here

## Summary

# References

Website HTML and CSS code and formatting

"HTML Tutorial," w3schools.com [Online]

Available: https://www.w3schools.com/html/default.asp

Accessed: 30/06/2020 - 16/07/2020