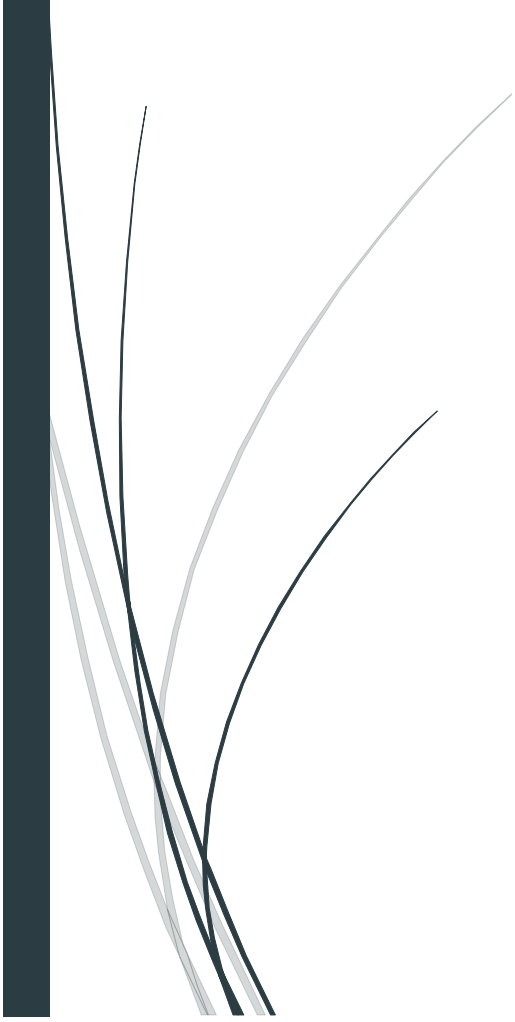
19th July 2020

IIT Assessment 2

Group 5 – The Technocrats



Contents

Team Profile

Personality Tests

Joe

student ID: S3862471

I first became interested in programming when I had to do an assignment on BASIC in year 9 in high school, which led to my talking my parents into buying me a Dick Smith System 80 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 in 1983 and started a degree in Mechanical Engineering at the University of Technology, Sydney (UTS, then the NSW Institute of Technology) in 1984 where I learned Fortran and dabbled in some other programming languages (Ratfor, Z80 Assembly code, Forth). I had to withdraw from the course before I finished. In 2010 I had another go at Mechanical Engineering, at Sydney University this time. In first semester I did Engineering Computing which covered Matlab. September last year I had to withdraw from the course having completed 89% of it. I have some experience in HTML and had a web site which made use of HTML and CSS but that is gone now. I also started a course on Udemy in writing applications for iOS, but I didn't complete it as I prioritised my university studies.

Meyers-Briggs Test [1]

(E)xtroverted: 24%

(S)ensing: 6%

(T)hinking: 16%

(J)udging: 54%

Learning Style Test [2]

Auditory: 60%

Visual: 25%

Tactile: 15%

IQ Test [3]

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: S3735636

I am a 22-year-old who has an interest in IT that is only on the surface of what technology can really do. I love video games; I recently built my own gaming PC and I like to work out how things fit together. However, that is as far as my knowledge goes. I have little experience in the technology field with computing and coding and have little use for it in

the career I am pursuing. My main hobbies include sports such as basketball, footy and video games.

16Personalities
(I)ntroverted:52%

(S)ensing: 18%

(T)hinking: 9%

(P)erceiving: 34%

Learning Style Test
Auditory: 20%

Visual: 45%

Tactile: 35%

Big Five Personality Test
Openness: 56%

Conscientiousness: 62.5%

Extraversion: 29%

Agreeableness: 83%

Neuroticism: 37.5%

These personality test results indicate my preference to work individually rather than as a group. In a team environment my introverted personality may mean that I am more suited to doing a personal task and inputting it back to the team once completed. My high scores in perceiving and agreeableness also make me a good team player in that I can easily help out the team and am more than happy to do what the team needs to succeed. My lack of knowledge in the IT department meant that I was little help with the website elements and therefore I used my skills on the research part of the assignment.

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 [4]
(I)ntroverted: 96%

I(N)tuitive: 71%

(T)hinking: 64%

(P)rospecting: 58%

(T)urbulent: 56%

Learning Style Test [5]
Reflector: 90%

Theorist: 75%

Pragmatist: 40%

Activist: 40%

Big Five Personality Test [6]
Openness: 51%

Conscientiousness: 29%

Extraversion: 1%

Agreeableness: 46%

Reactiveness: 47%

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 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: S3868543

I have always been interested in computing technology for as long as I can remember. Growing up we always had a computer in the house, and I found myself being the go-to

person for technology related issues. As time went on and I developed an interest in gaming my competence within computing also expanded as a result. I am nowhere near adept in the area, but my interest and desired career naturally line up as a result.

Myers-Briggs Test	*Style Test*	*Big 5 Personality Test*
(E)xtraversion	Auditory – 45%	Openness – 87.5%
I(N)tuition	Visual – 20%	Conscientiousness – 12.5%
(F)eeling	Tactile – 35%	Extraversion – 77%
(P)ercieving		Agreeableness – 67%
		Neuroticism – 46%

As someone who is quite familiar with the 16 personalities and big 5 personality tests the results do not come as a surprise to me. The learning style test revealing the majority auditory result was quite a surprise, however. I am not sure what led me to believe that would most likely be my lowest score but upon consideration its extremely obvious to me that it should not. Whenever I solve a math equation, I must spell it out in my mind. Whenever I read, I almost always read each word aloud in my mind and background noise leaves me completely unable to focus. Discovering this has been quite useful as I can manipulate my surroundings to allow myself the best chance at deep concentration.

Upon inspection of my teammate's personal profiles it is obvious that we have a very well rounded and diverse team. My own personal shortcomings as mentioned in the big 5 personality test are low conscientiousness and difficulty sticking to routine. This could otherwise bring down a team if it were not for the stable group surrounding me. There are some among us that are agreeable, conscientious, extraverted, or open and some that are the opposite. Such diversity in opinions and traits tend to lead to better functioning teams.

Torin

student ID: S3863563

My interest in IT goes back to some of my earliest memories at home. I remember our old dial-up connection beeping away, taking so long to produce even an image. Limewire and Torrents came next, accidentally downloading viruses onto the family computer, while only trying to get a few songs on my 512mb mp3 player. At the local Trash & Treasure I would often find old computers to take apart and check out their insides. Removing the fans to connect to 9v batteries was always exciting. Later in life I found an interest in graphic design, sound engineering and a small amount of coding through internet courses. The graphic design was a creative outlet for me, as my pen to paper art skills are sub-par at best. My interest in live sound led me to connect two of my passions, technology, and music. Most recently, I have begun to delve into the world of coding, which brought me to this course.

Myers-Briggs Personality Index [7]

(I)ntroverted

I(N)tuituve

(F)eeling

(J)udging

Learning Style Test [2]

Auditory: 40%

Visual: 45%

Tactile: 15%

Big Five Personality Test [8]

Open-Mindedness: High

Conscientiousness: High

Extraversion: Very high

Agreeableness: Low

Negative Emotionality: Medium

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: S3756051

It is clear to me that I am not a traditional learner, I can be very creative but also doing standard book learning exercises is not my ideal method. I work well in teams and can be very inclusive and attentive to others needs.

I really can work with most groups and can be a good leader or follower, I am good communicator and can bring people along the journey.

A group should form with different personalities and mixing the workload to fit each person. Being inclusive and understanding of skills and preferred tasks will be critical to success.

Summary and Discussion

Joe - ESTJ

Marcus - ISTP

Murray - INTPT

Ossama - ENFP

Torin - INFJ

Tyson - INFPA

Our group has many different test scores and personality traits which may work in our favour as we are all slightly different in the way we approach our learning. There are some, like Murray and Marcus, who are introverted and like to work predominantly alone, while Ossama and Joe have higher scores in extraversion which help them to be outspoken and bring the group together. Murray's rational thinking helps the group to stay on track whilst Tyson and Ossama's tendency to focus more on feeling than logic will create a good mix within the group. Between everyone in the group we have at least 2 of every characteristic in the Myers/Briggs Personality tests that were tested for.

Two people found Meyers/Briggs tests that tested for a 5th characteristic, and they had different results for that characteristic, so we've probably covered all the bases. This means we have a well-rounded group. Joe's Meyers/Briggs results suggested he'd make a

good leader, but it was Murray who took a de-facto leadership role, reminding people of what still needed to be done, encouraging people to get their contributions in and contribute to the polls for the group name and meeting times, as well as putting together the web site and the report for the group and creating the group GitHub repository.

Overall, the balance of different personality types made the group function well together.

Ideal Jobs

Joe

My ideal job is as a software developer for a company that has products to help people with disabilities. This has become less specific than at the start of this course, and now I am prepared to be flexible and take on pretty well any software developer position if my ideal position isn't available.

Marcus

After receiving feedback from assignment 1 my stance on my ideal job has not changed. I am still looking to work towards financial planning however I have gained an appreciation for more IT-specific skills, which may help me in the future. At first I though that my introverted nature may hold me back, however as I have now worked in the finance industry for 3 years now and have continued my studies I feel that I have put myself in a position to work on this part of myself to reach my potential.

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. The main thing that attribute that I currently want in a career is at least some degree of creative freedom, which I believe would be easier to attain as a software engineer, though cybersecurity may offer more in the way of diversity.

Ossama

After receiving feedback and viewing each other's ideal jobs and contemplating about the advantages that would aid certain roles within IT, I feel set in my assertion that a helpdesk or customer service role would be best suited for me. Not only does it take advantage of my perceived personality traits, but it also makes use of my experience in the workforce.

Torin

After the commencement of Assignment 2, I have more confidence in my ideal job scenario. Though the confidence in my job path has grown I also have investigated more philanthropic careers. With this in mind, I could look at positions that may take my initial idea and connect a more socially conscious attitude toward work

Tyson

In assignment 1 I listed the job "Chief Data and Analytics Officer" which is a lofty job that involves a high level of business experience mixed with a high level of technical knowledge. This is what interests me from my 15+ years of work experience.

I see that myself and Marcus align wanting to take a business topic and IT topic to find the mix of two passions. I believe that working on topics that you truly find interesting to be the first indicator for success. This process has reaffirmed my belief of my first "ideal job".

Summary and Discussion

Upon reviewing member's ideal jobs some similarities are apparent. Tyson and Marcus both seem to be interested in the business side of IT. Marcus merging IT with finance and Tyson focusing on data analysis and retrieval. Another parallel is between Murray, Joe and Torin. Joe being interested specifically in mobile development, Murray seeking a software engineer role and Torin looking to pursue a lead role in software development. Torin's high conscientiousness and extraversion will certainly help him in this endeavour.

Industry Data

Joe

Sites such as Statista [9], JobOutlook [10], and Industry Connect [11] indicate strong ongoing growth in the area of software development and the career path of software developer. Although Joe would ideally like to work in making things more accessible to people with disabilities, he is flexible enough to take advantage of any opportunities in this area that may arise and this should stand him in good stead for work in the future.

Marcus

According to Burning Glass [12] my ideal role in Financial Planning is not on the list as it requires minimal IT skills.

The general skills required in my job are similar of that in any IT profession, including communication and organisational skills which are unanimously important today shown by being in the top 3 generic skills in the Burning Glass tool. In this job, you are often working with people who have extremely limited knowledge in finance and therefore communication skills, being able to explain things in a way that the client will understand is extremely important. The top 3 generic skills that are not required within my ideal job are troubleshooting, creativity and mentoring. Troubleshooting is not necessary as it is not a direct part of the job, while creativity is not necessary as financial planning relies mainly on data, research and regulations.

The top IT skills that are necessary for Financial Planners are Microsoft Windows which was 4th on the list as well as business management and building relationships being extremely important as well. Microsoft Windows is the operating system used by most businesses, while building relationships with your clients is essential to keep current and attract new business. The three highest ranked IT-specific skills outside of my jobs required skill set are SQL, JavaScript and JAVA; all of which were the top 3 IT-specific skills which reinforces the fact that my ideal job does not require a great deal of IT knowledge or skill.

Murray

According to Burning Glass [12] 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

As mentioned in Burning Glass [12] the ‘Service Desk Analyst’ job title is the fifth most frequent job posting in the ‘Information Technology’ sector from March 2017 to March 2018. This section of IT is where I believe myself to have the most inherent advantage and

interest. Of the 121,997 job postings in Australia and New Zealand of this time frame the most desired generic skill is 'Communication Skills' (44,367) which goes hand in hand with my desired job title. 'Problem solving' (16,445) is second on the list which is a considerable aspect of the job's responsibilities as well. 'Troubleshooting' (11,471) is also found in sixth place and is the fundamental responsibility of a helpdesk technician. Of the specialised skills in the IT industry 'Building Relationships' (2,119), 'Technical Support' (1,830) and 'Customer Service' (1,411) are all inclusions that relate directly to my desired job title. Given that this type of role is often an entry level position, this ideal job goal is quite a humble one. It sets the bar to a low and achievable level which leaves the door open for future opportunities. Rather than setting a distant goal of multiple years of study and experience I operate much more effectively on short attainable targets that leave room for spontaneous decision making.

Torin

On reviewing the Burning Glass data [12], I can see the demand for Solutions Architects is the highest of all categories. Technology Lead with my ideal job is the most similar to this category. The general skills this position will require are strong management, communication, verbal and written skills. According to Burning Glass, communication and writing skills ranked very high where leadership and verbal skills were ranked on the lower end of the spectrum.

The IT specific skills relevant to my job are Java, AWS, and PHP. While Java ranked second highest in the Burning Glass research, the remaining skills weren't mentioned. In another report from Darwin Recruitment, the US has seen people using PHP less but the job demand remains roughly the same [13] Cloud Computing services like AWS are on the rise as well. In the US, Indeed.com has reported a 418% increase in job demand for AWS skills in the last 5 years. [14]

The three highest-ranked general skills not in my ideal job are mentoring, quality assurance and control and being self-starter. The top highest ranked IT specific skills not relevant to my job are SQL, JavaScript and Windows.

After looking over the data, my ideal job scenario seems to be one of the highest generally ranked positions and skills within the current state of the IT industry. I haven't changed my mind due to this.

Tyson

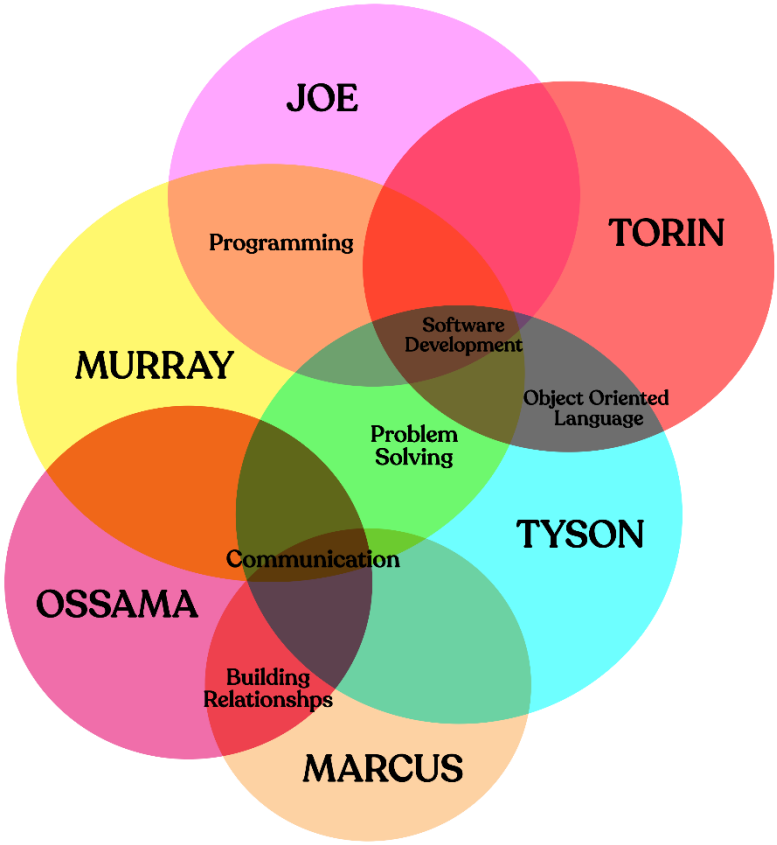
After reviewing the data from Burning Glass [12] my ideal role doesn't appear in the "Top IT Skills" or "Top IT Job Titles" which is surprising to me. We are seeing a large growth in the data analytics space and I had assumed this would be one of the job titles near the top. I do see some IT Skills and Generic Skills appear like Python and Problem Solving.

After looking at the market I believe that the skills I have already developed and the skills I am attempting to build via this course and other methods are going to put myself to land a job that requires a very specific set of knowledge that isn't easy to obtain. This of course does limit the amount of jobs I can apply for, but the current shortage of talent will allow me to have advantageous position.

I do believe that expanding on my knowledge to hit some of the IT Skills and Generic Skills categories will have a long term advantage and I plan to focus on gaining more knowledge in the areas: SQL, Linux, Writing and Quality Assurance and Control.

Summary and Discussion

Of the skills each member of the group listed there were some similarities mentioned. Joe, Tyson, Murray and Torin's ideal jobs all involved software development in varying languages and capacities. Ossama and Marcus both showed interest in jobs which involve building relationships and communication with customers and team members. Murray and Tyson both required problem solving to be a part of their job circumstance. Murray and Joe both required programming skills to be implemented in their positions.



IT Work

Report

Foreword

The interview was conducted with John Hemans of Pizza Hut Australia using Zoom. Total recording was approximately 15 minutes. There may be some slight errors in the transcript which do not change the meaning of the sentences within which they occurred. Sound and video recordings available upon request.

Review

John Hemans is the main front end developer for Pizza Hut Australia. He mainly works with other IT people, and Pizza Hut's marketing department, the latter of which seem to present a challenge at times (this was not stated but inferred from nonverbal communication).

He meets with marketing once a fortnight and they came up in a few of the questions. Apart from the expected work of making a large company web site with a high volume of traffic run smoothly and do everything the customer would like, a lot of work has gone in to making the web site configurable to people within the company such as marketing and people further up the leadership hierarchy.

Apart from the above, a lot of the work is debugging. One major project was implementing a debugging interface which acts to catch bugs customers run into and provides the IT team with information about them in real time.

Terminology

Some terms in the transcript may require further explanation. These are given below:

"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."

"The front end of a website is the part that users interact with. Everything that you see when you're navigating around the Internet, from fonts and colors (sic) to dropdown menus and sliders, is a combo of HTML, CSS, and JavaScript being controlled by your computer's browser." [15]

"The back end of a website consists of a server, an application, and a database. A back-end developer builds and maintains the technology that powers those components which, together, enable the user-facing side of the website to even exist in the first place." [16] Forward facing web sites are those aimed at consumers and the general public.

"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."

"DevOps is a software development strategy which bridges the gap between the developers and the IT staff. With DevOps, organizations can release small features very quickly and incorporate the feedback which they receive, very quickly." – Saurabh [17]

"A systems architect is a technology professional who develops and implements computer systems and networks for an organization. He or she defines the architecture of a system in order to fulfil certain requirements." [18]

"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 a order system API or whatever is required on the front end to communicate with our back end systems."

"Amazon Web Services (AWS) is a subsidiary of Amazon that provides on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered pay-as-you-go basis." [19]

"C# (C-Sharp) is a programming language developed by Microsoft that runs on the .NET Framework. C# is used to develop web apps, desktop apps, mobile apps, games and much more." [20]

"An application programming interface (API) is a computing interface which defines interactions between multiple software intermediaries." [21]

"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 ..."

"Agile methodology is a type of project management process, mainly used for software development, where demands and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customers." [22]

Transcript

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.

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.” [23] 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.” [24] This makes phishing a top priority in cybersecurity.

US Security company Area 1 [25] 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.” [26] 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 defense 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." [27]

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" [28]. 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." [29] 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 [30] 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" [31]. 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' [32] on the road to being fully driverless.

No automation

Driver assistance

Partial Automation

Conditional Automation

High Automation

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” [33]. 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.

Natural Language Processing

What is Natural Language Processing?

Natural language processing, or NLP, is essentially the understanding of natural language to computers and the ability to generate data into natural understandable language. It is a very complicated aspect of technology that effectively blends computer science with linguistics. It has a storied history of continual and systematic developments that have led to the robust position it now holds in the technology industry. It is used in speech recognition, answering questions, chatterbots, machine translation and the list goes on. Most high-profile search engines, operating systems and a multitude of different programs use several different forms of natural language processing. With the rise of voice user interfaces such as Cortana, Siri or Alexa speech recognition is becoming the fastest and most convenient method of retrieving information or even giving directives to your mobile phone, computer, gaming console or car. An example of this convenience would be the ease and simplicity of commanding your mobile phone to 'set an alarm for 9.30am' rather than having to unlock your phone, open the application and manually set the alarm. It has also made phone calls while driving a possibility since modern cars are often equipped with Bluetooth connection and sometimes even speech recognition software of their own. As developments in natural language processing and in computing power have propelled it to new heights in the last couple decades its utility and benefits are unquestionable. Some form or another of natural language processing is ubiquitous with almost any usage of technology today. Whether that is browsing the internet, using a mobile phone or even operating household technology such as lights, televisions, or automatic blinds.

How Natural Language Processing Works

Natural language processing is made up of two main components. One being natural language understanding and the other being natural language generation. Natural language understanding governs the ability for software to understand any given text or speech and interpret it, whereas natural language generation is the ability to construct natural language. For instance, the English language has 9 fundamental types of words which are nouns, verbs, pronouns, adjectives, adverbs, conjunctions, interjections, articles and prepositions. NLP software breaks down the entire English language into understandable sections and usable words to create natural language. The main way it achieves this is by executing a few processes such as tokenisation, stemming, lemmatisation, POS tags, named entity recognition and chunking. Tokenisation is the ability to section off parts of a language such as words or symbols to understand them individually. Stemming is the ability to originate words into their root forms to understand their meaning. Lemmatization is a somewhat more inclusive version of stemming. It can map words back to the original root word similar to stemming however it is not limited to simple conjugation or pluralisation. For example, 'went' would be converted into 'go'. POS tags are tags given to words to understand their place within the language. Such as labelling a word as an adjective, noun or verb. By applying POS tags to certain kinds of words the software is able to understand the given sentence structure. Named entity recognition is how nouns are labelled to be a location, person, organisation, etc. Finally, chunks are how the individual information from the POS tags, tokenisation, stemming, lemmatization and named entity recognition all come together to form a complete and natural sentence. [34] [35]

Speech Recognition and Chatterbots

Natural language processing has not always been an important part of the technology industry. For example, the earliest known speech recognition software was created in

1952 and was nicknamed Audrey (Automatic Digit Recogniser). This software was able to recognise all ten numerical digits if it was said slowly enough and clearly enough for Audrey to understand. Although this may seem like a breakthrough in technology the utility of it simply was not applicable enough given that it was considerably faster to simply input the digit at the press of a button. However, Audrey gave rise to the idea of speech recognition and is the earliest precursor to the modern-day complex software that runs programs such as Alexa or Siri.

Next in line of significance in the breadth of technological advancements of speech recognition was a program called HARPY which was the first system to recognise over 1,000 words. [36] Regardless of the large diction it possessed, mainstream use of the advancement was extremely limited due to the large amount of processing time. Computers of its time were simply not powerful enough to transcribe natural language fast enough for HARPY to be an effective addition to programs or technology. With advancements in computing power came the feasibility of speech recognition software and is the main reason for its emancipation and ubiquitous usage today. [34]

However, speech recognition is just one application of natural language processing. Chatterbots are another usage of NLP which are found within the realm of customer service frequently. It also pairs very well with social media. Open Universities which I happen to study through also have their own chatterbot which I have found useful in the past. Chatterbots have also served to make some types of customer service or helpdesk roles redundant as a chatterbot dispensing advice on the most common troubleshooting issues significantly cuts down the amount of inquiries the helpdesk employee is likely to receive. The oldest forms of chatterbots would rely on programmers to individually map out what a user could say and in turn map out an appropriate response. This was extremely difficult to create, maintain or update and would not account for spelling errors or most importantly other languages. As it was such a taxing application of natural language processing it did not find a strong footing until very large sample sizes of human to human interaction data was available. This allowed artificial intelligence to spear head and streamline the process which could account for multiple languages, Large diverse vocabularies, words with multiple meanings, unique word play, expressions or slang. This has all led to chatterbots being so believable that they can have a complete conversation with someone and be a convincing substitute for human interaction.

Conclusion

Personally, natural language processing plays a few roles in my own life. When I google search anything, I rarely type the entire sentence. When I watch a YouTube clip, I rarely watch without automated captions. When I text someone, I heavily rely on predictive text not to embarrass myself. And when I browse Facebook, I often rely on the machine translations to understand friends of a different language.

Natural language processing occupies such a considerable section in technology that its effects are almost impossible to count and as the bridge between computer and natural language gets smaller and smaller the utility for it will get more and more ingrained in society. From autonomous cars to robots and maybe even controllerless gaming consoles. The future of technology looks bright and the future of natural language processing looks even brighter.

Machine Learning

What is machine learning?

"Machine Learning" was first used by IBM programmer Arthur Samuel in 1952. Samuel had written a checkers-playing program that "learned" and got better the more it played. He used a technique called "alpha-beta pruning", which would score the board based on the position of the pieces and either side's chance of winning. This model evolved into the minmax algorithm that is still taught today." [37]

Machine Learning (ML) is an approach to achieve artificial intelligence through systems that can learn from experience to find patters in data. Machine learning involves teaching a computer to recognise patterns through large amounts of examples, this is different compared to programming specific rules. You can reuse machine learning with different types of data which makes it very powerful. Machine Learning can be considered a subset of Artificial Intelligence. A common expression seen in many places "All machine learning is considered artificial intelligence but not all artificial intelligence is machine learning." [37]

Machine Learning goal is to predict patterns after training itself on large amounts of data. It takes a large amount of data to train the system, time to learn the pattern and it can find new data that it has not seen before. With time and data machine learning learns from itself.

Today we are seeing a huge growth for Machine Learning, some obvious examples translations, search results, voice assistants, maps etc... This has allowed large amounts of data to be processed and improve these tools beyond belief of the not so distant past.

The biggest inhibitor for machine learning is processing power and data availability. The second data availability is being solved every day with more and more people online and processes slowly being "digitised". As data becomes available machine learning enables people to process and understand the data we are accessing, this is a matter of time and not technical limitations. The other issue is processing power at the moment we are hitting caps and Moore's law has started to slow down. We are now starting to see quantum computing becoming a large topic, fundamentally changing how a computer works, a brief quote to explain quantum computing "The computers that we are currently use are built using transistors and the data is stored in the form of binary 0 and 1. Quantum computers are built using subatomic particles called quantum bits, qubits for short, which can be in multiple states at the same time. The main advantage of quantum computers is that they can perform highly complex operations at supersonic speeds. Thus, they solve problems that are not currently feasible". [38] As you can see this means Quantum Computing has the potential to improve Machine Learning and Artificial Intelligence beyond belief, as quantum computing becomes widely available and solutions are made to utilise these new computers we will see large amounts of processing power able to handle much larger amounts of data then what is possible today.

Some discussion around what is possible with the combination of Quantum Computing and Machine Learning. One of the most interesting solution would be real time language processing, many devices today are already able to do this to a high level but with Quantum Computing it would be as fast as the human ear on processing information and changing it another language. This could be done for speaking as well and even take into account tone and inflections. This could completely remove the gap of language between people.

What is the likely impact?

Machine Learning has a large impact on the world today already taking tasks such as:

Translation – Tools have already been used to take the jobs of many translators but not all of course. It doesn't solve all the problems of translation but does a large amount of work for the majority.

Search Results – Search engines have never been quicker or better with the use of machine learning large amounts of data has been able to be processed and organised to a very high level of accuracy.

Data Processing – Data processing used to be a manual job for a large amount of people, every day this is becoming less and less of a problem.

Self-Driving Cars – As mentioned in another technology review self-driving cars are growing area of business with Machine Learning playing a large part of this development.

We are seeing tasks being replaced and in some cases jobs, the risk for our society sits with how we handle the jobs being replaced and not so much the tasks. Many companies are starting to predict that within the next 10 years that vehicle drivers such as truck drivers, taxi/uber drivers etc... this equates to a large portion of our current workforce. A study by pwc indicates that this will put 44% of workers with low education at risk. [39]

Unlike other technical advancement this isn't a case of creating new jobs while taking others. Machine learning has a very large ability to scale with processing power and data and as mentioned earlier this is starting to not be a problem with advances in computing.

How will this affect me?

Machine learning has the ability to change how everything we do in daily life. Everything from transportation, food delivery, information processing, manual tasks. It will have a wide-reaching influence and be a touch point for everyday life.

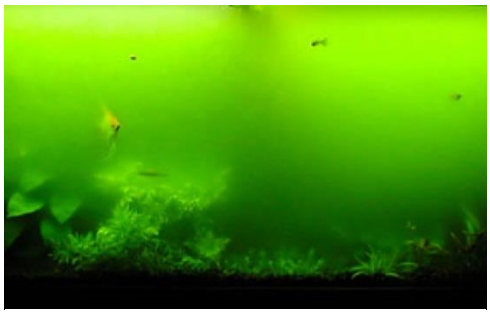
Personally, I work in an industry that has not been touched by the modern technology we see in today's world. This is starting to change as more data is being made available, we are starting to see highly technical tasks becoming more and more likely to be replaced by machine learning. Labour in the building industry historically has been very specific to each building and always needed on site, as we start to see an ageing workforce we are getting less technical people replacing the onsite staff. Technology has been the tool people are latching on to replace these resources, to date we are seeing more advanced rules based programming being the largest part but now with more data available machine learning is playing a large part and starting to effect how processes that have been in place for 30+ years are now being changed to rely on machine learning to find a problem through pattern recognition and instead of routine based checks on physical equipment being told when it needs to be repaired and if its working at 100% efficiency.

My industry isn't the only one being affected, family members work transportation and courier company. This industry is at a high risk of change with self-driving cars and delivery predicted to being solve in the near future. This could replace a large portion of the workforce and not just tasks but complete jobs without creating new jobs that can utilised the existing workforce.

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.



'Green water' caused by ammonia build up and excessive lighting [40]

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.

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:

- Animal/plant feeders
- Heaters
- Thermometers
- Filters
- Lights
- Timers
- Water level monitors
- Controllable water reservoirs
- Aerators
- Chemical concentration monitors
- 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.

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