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Date stamp

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COSC2196

Introduction to Information Technology

Assessment 2: Team Project

Report document

Alexis Satre
Jarrad Elvey
David Egan
Ayub Khayre
Jonathan Seah

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Introduction

This report (and website) is for Assignment Two of RMIT's Introduction to Information Technology (in Study Period Four of 2020). The assignment calls for several sections ranging from information about our team (both individually and collectively), to information on several aspects of the IT industry, to our reflection on our team and on aspects of the IT industry. One of the more important sections is describing in detail an IT Project that our team has chosen that will be realised (at least in part) in later assignments in this course.

The project that our team chose is a simple idea that will save time for people who write reports that feature a lot of reused sentence fragments (doctors, psychologists, physiotherapists, and anyone who potentially writes reports on mobile devices). The most appropriate technology to use for the prototype, and perhaps even the finished product, is a Progressive Web Application, which we have addressed within this report.

Our project being a Progressive Web Application has had a direct influence upon the website portion of this assignment. There is not any prescription in the requirements of the assignment as to what the website needs to be (other than that it must contain the same content as the report). As such that portion of the assignment is also in the form of a Progressive Web Application to further emphasise how our project design could work and to begin to gain experience towards creating applications of that type.

In completing this assignment, we split the required content into smaller tasks, assigning these tasks among the group in line with our individual strengths, skills and Assignment 1 feedback. This also helped to ensure that there was equal contribution among the team which is discussed further within the Tools section of this report.
This enabled all group members to have an active role in all aspects of the assignment and to gain further experience working together as a team.

Team Profile

Team Name

Our team selected the group name **SEEKS** because we desire to obtain knowledge and achieve our goals, not only for this project but also our future endeavours. Additionally, the first letters of each of our last names arranged into the word SEEKS.

Personal Information

Figure 1: *Jarrad Elvey by Elvey 2020*

Jarrad Elvey (s3884930) – Team leader of SEEKS

Jarrad was born in Western Australia in 1987 and is currently in the process of designing and building a micro-house, office and human powered vehicle. Jarrad has many hobbies such as reading, writing and creating/inventing. His IT interests include analysing systems and making them better. Regarding Information technology experience Jarrad has worked in an IT store, he has also worked with Linux operating systems and has many certifications including CompTIA (Linux+, A+, and Systems support specialist).

Figure 2*: David Egan by Egan 2020*

David Egan (s3874093)

David was born in Australia and has been working since he was 14. He has some experience within the IT industry having worked as a computer repair technician for a number of years before moving to Melbourne to work for Australia Post. David's hobbies include taking care of his pet chickens, reading fantasy novels and setting up Christmas lights. His interests in IT involve gaming, VR and generally finding out how different technologies work.

Figure 3: *Alexis Satre by Satre 2020*

Alexis Satre (s3889429)

Alexis is from Australia and Canada, he has a Bachelor of Technology in Aeronautical Engineering and was previously a Pilot. Alexis enjoys surfing, reading, Latin dance and watching Movies. His IT interest include cryptography, security data and Integrity. Alexis has knowledge of programming languages such as Python, JavaScript and Swift. Using the languages Swift and Python he has created an iOS application to automate fuel planning.

Figure 4: *Jonathan Seah by Seah 2020*

Jonathan Seah (S3740073)

Jonathan has grown up with his "hands on a keyboard" and has been using computers from a very young age. His hobbies include playing computer games and reading/writing novels. Jonathan is interested in Cloud technologies, machine learning and game development. Jonathan has worked as a PACS administrator at a major hospital, he has also worked in several other roles where he was required to do project planning, website maintenance and debugging.

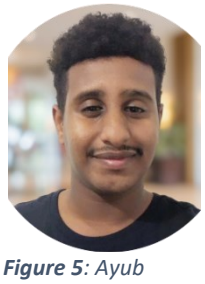


Figure 5*: Ayub Khayre by Khayre 2020*

Ayub Khayre (s3686323)

Ayub was born and raised in Australia, however his cultural background is Somali. He briefly studied a Bachelor of Bioscience and has a Certificate III in Telecommunications. His hobbies include reading, playing sports and watching movies. Ayub's IT interests include Cloud computing and database storage. He has previously worked as a Telecommunications technician and as Level 1 helpdesk technician at a software company.

Team Profile

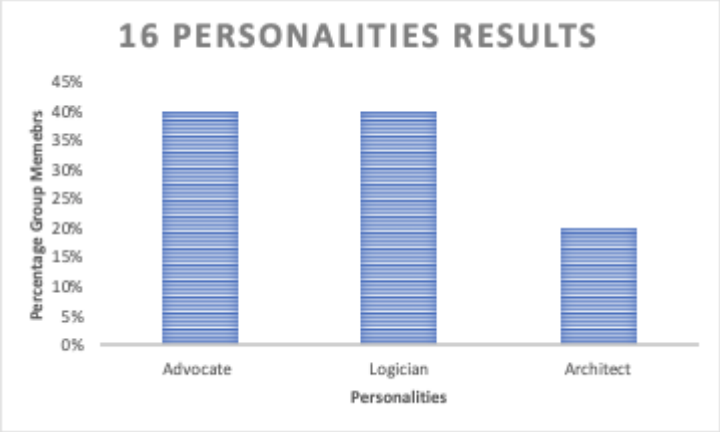
Table 1: *Team personality test results*

Name	*MBTI*	*Learning Styles*	*Enneagram*
Jarrad Elvey	INTJ-A	Auditory: 30% **Visual: 45%** Tactile: 25%	**Type 5 (98%)** Type 8 (83%)
David Egan	Advocate (INFJ-A/INFJ-T)	**Kinesthetics (Hands on) 39%** Visual learning (32%), Auditory (29%)	**Type 1 (98%)** Type 2 - 90%
Alexis Satre	Logician (INTP-T)	Auditory: 0% **Visual: 60%** Tactile: 40%	**Type 1 (98%)** Type 5 (97%)
Jonathan Seah	Logician (INTP)	**Auditory: 40%,** Visual: 35%, Tactile: 25%	**Type 5 (98%)** Type 8 (81%)
Ayub Khayre	Advocate (INFJ-A/INFJ-T)	Auditory: 25% **Visual: 45%** Tactile: 30%	**Type 6 (98%)** Type 1 (96%)

Understanding the results

Test 1 (16 Personalities)

Table 2: *16 Personalities Results*



As displayed in Table 2, forty percent of our group members have the personality type advocate, the advantage of having advocates in a group situation is advantageous as they can “make nearly any position work” (NERIS Analytics Limited, 2013a) Having a high percentage of individuals than can work in any positions can be extremely beneficial in a group scenario. This reduces conflict when it comes to assigning groups roles and tasks. The conflict adverse nature of advocates can sometimes be considered as a disadvantage having individuals that are reluctant to voice their opinion may result in some issues, therefore it is important that decisions are made as a group using methods as group voting and decision making (Truity, 2019).

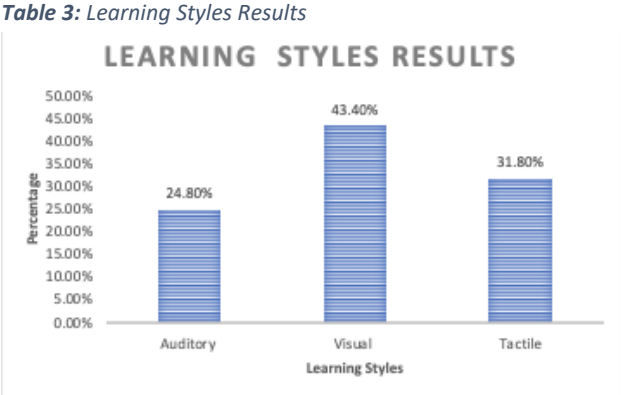
Group SEEKS contains two members with the Logician Personality type, unlike the advocate personality type logicians “logician personalities prefer to work alone” (16Personalities, n.d.). As the name of the personality type hints, logicians are very logical in nature, they can break down complex issues into smaller pieces and have analytical skills that can be used to make a team better. It is beneficial to have logicians in a group as they can assist with problem solving, however their introverted and do it yourself personality type may be an obstacle when it comes to communication. Therefore, it is important to have follow up meetings to ensure that there is clear communication in a group environment.

The team leader of group SEEKS has the architect personality type. “Architects are known for their independence” and will find it difficult to work under a “Micro-managing” boss (16Personalities, n.d.). As independence is very important for the Architect personality type it is often difficulty for them to work in a group environment as they find it difficult to depend on individuals. This personality type often disregards hierarchies. This can be extremely beneficial in an agile environment; however, this may not be an advantage depending on the type of personalities in a group. This is because some individuals prefer to work in set structures and hierarchies (NERIS Analytics Limited, 2013).

The information detailed above may be helpful for our group members as it provides some insight on the individuals in our groups and how to best interact with them. With the right leader knowing one’s likelihood of behaviour in a workplace or group dynamic can result in proactiveness and a positive group experience.

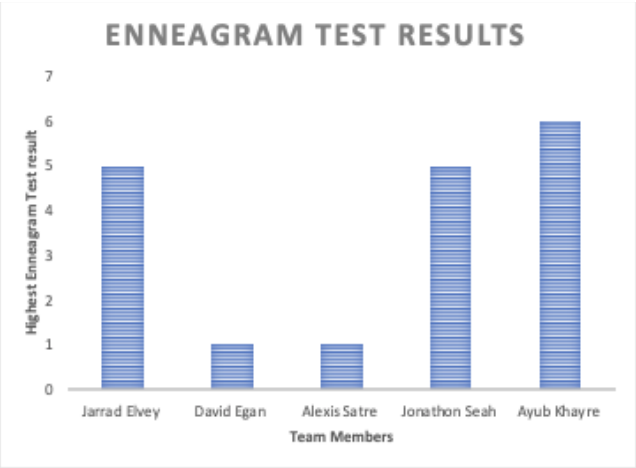
Test 2 (Learning Style Test)

Table 3: *Learning Styles Results*



From our results from the Learning Styles test the most dominant style for our group was the visual learning style (43.40% Visual learners). Meaning team SEEKS will need to implement visual learning methods such as drawing out diagrams using colours and writing down key words and information. Visual learners “prefer reading a story rather than listening to it” (Study.com, n.d.) and “Learn from seeing things written out” (Study.com, n.d.). This makes sense as our team scored the lowest for the learning style auditory. In order to succeed team SEEKS will need to utilise required documentation such as their weekly actions and agendas. The information from the Learning Styles test may be helpful as it assists us in determining our teams most dominant learning style. This will then enable us to implement the learning techniques that work to our strengths.

Table 4: *Highest Enneagram Test Results for team SEEKS*



Test 3 (Enneagram Test)

The Enneagram test delves into “how people interpret the world and manage their emotions” (Truity, 2020). The test contains nine personality types that are defined by a core belief.

As displayed in the table above our teams most common personality type was Type 5 which was closely followed by Type 1. From the website https://www.truity.com/ individuals with the personality Type 5 are said to “seek understanding and knowledge and are more comfortable with data than people” (Truity, 2020). Whereas people with the Personality Type 1 “place a lot of emphasis on following the rules and doing things correctly” (Truity, 2020). Type five directly correlates with the logician personality from the 16 personalities test. This test reinforces that our group consists of logical thinkers, like the personality test it may take some time for group members to be comfortable with one another. With this in mind, our team will need to set proactive goals for group members to ensure that the completion of the assignment is on schedule. This type of organisation can provide some piece of mind to team members, building trust along the way.

The information gathered from the Enneagram test is especially helpful as it outlines the most dominant beliefs for our group and provides us with the insight that we are a data driven team which will focus on completing tasks correctly.

Ideal Jobs

Table 5: *Outlines the Ideal jobs for each team member*

Team Member	*Ideal Job Title*	*Skills Required*
Jarrad Elvey	VR/AR, Software Developer/Engineer	Experience working in the IT industry as a software developer Programming Experience Experience writing software for existing hardware Linux experience Exposure to VR/AR headsets Teamwork
David Egan	Virtual Reality (VR) and Augmented Reality (AR) Engineer	BA or BSc degree 2+ Years working in the IT industry as a software developer Understanding of AR and VR technologies, hardware and software platforms Understanding several programming languages and be able to interpret data effectively. Ability to work well in a team environment
Alexis Satre	Product Manager	2 years of experience in product management of integrated software/hardware/service products Knowledge of blockchain technology and experience with data analysis software Teamwork - working in a team
Jonathan Seah	Software Engineer (Predication & Insights)	Computer programming and coding Software development experience Software testing and debugging Problem solving and logical thinking Teamwork
Ayub Khayre	Senior Engineer (L3) - IT Service Desk	Prior Helpdesk support Experience in management of windows operating systems Office 365 experience Active directory experience Customer Service and teamwork experience

As outlined in table 5, the ideal jobs for our group members are somewhat like one another. Three of our team members wish to work as Software Engineers, one of our group members wish to work as Product Manager, and the last group member wishes to work as a Service Desk Engineer.

For the software engineering role, the similarities between roles include an ability to write code, prior Information Technology experience and the capability of working with others in a team environment. Although these jobs are similar, two of our team members ideal roles do specialize in AR/VR technology, this further adds required skills such as exposure to VR/AR headsets and an understanding of AR/VR technology.

Although the Software Engineer roles are similar the Service desk and Product Manager roles are not. The Product Manager role requires more experience with data analysis software and project management whereas the Service desk role requires networking knowledge and management of systems such as Office 365 and Active Directory.

Although all our ideal jobs may vary, one factor that is ubiquitous across all these roles is teamwork. The ability to work as a team is commonplace throughout the Information Technology industry. This skill should be constantly developed and built to enhance communication and team success.

Tools

Assignment 1 websites:

- David Egan: https://dpegan81.github.io/dpegan81/
- Ayub Khayre: https://AyubKhayre.github.io/A1_Website/
- Jarrad Elvey: https://chameleon-rmit.github.io/IT-Profile/
- Jonathan Seah: https://s3740073.github.io/s3740073.github.io/
- Alexis Satre: https://lxstr.github.io

GitHub Repository: https://github.com/Chameleon-rmit/IIT-Assignment-2
GitHub Pages/Group website: https://chameleon-rmit.github.io/IIT-Assignment-2/

The Assignment 2 brief stated that the GitHub repository that is to be used for the website portion of the assignment may also be used to hold other reports or information. Our group has decided to work more collaboratively, seeking feedback from the group on the content that we are creating. And we are using the in-built document editing of MS Teams (via SharePoint) to do so, which is cloud-based and so is not conducive to saving to a version control system. SharePoint itself does have version control functionality built in and the history of content updates to the files can be looked up. As such, the audit trail on our group Git repository will not accurately reflect our group's contribution and will likely only show the history of the website portion of the assignment, which will be created using the content from the rest of the group.

The way that we tracked and assigned team member's contributions to the assignment was to create a document at the start that split the assignment into task groups that could then be chosen by or assigned to each person. The aim was for each team member to contribute to the assignment equally. With a total of 14 task groups and 5 team members each team member would be responsible for 2.8 task groups each and it ended up divided as follows:

- **Ayub**: Team Profile, Ideal Jobs, IT Technologies (Blockchain) (shared)
  3 total tasks.
- **David**: IT Technologies (VR), Industry Data, PDF Report
  3 total tasks.
- **Alexis**: IT Work/Interview, Meeting Minutes & Task assignment, A2 Project Idea (shared), IT Technologies (Blockchain) (shared)
  3 total tasks.
- **Jonathan**: IT Technologies (Machine Learning), IT Technologies (Natural Language Processing), A2 Project Idea (shared)
  3 total tasks.
- **Jarrad**: Tools, Leadership, Web Page
  3 total tasks.

***Figure 6**: Working Together, n.d., is licensed under CC BY-SA*

There were also General Tasks that each member of our team was required to do.
These included adding our personal paragraphs to the Industry Data section, the Group Reflection section, and assistance in content creation outside of providing feedback where it was needed.

Tools Used

MS Teams: We used MS Teams for text discussions related to the assignment as well as for our bi-weekly meetings.
SharePoint: (MS Teams integrated applications): We used the document and spreadsheet applications for our document artefacts.
Tasks by Planner and To Do: (MS Teams integrated application): We used the default MS Teams task application to set reminders for the due dates of tasks decided in our meetings.
MS Stream: (MS Teams integrated application): Our video meetings were recorded to Microsoft's Stream web application.
MyBib.com: A highly polished citation web application that allowed the team to collaboratively work on our references and maintain a consistent style throughout the report.

GitHub: Our use of GitHub in this assignment primarily involved a place for the website portion of the assignment to be hosted. The GitHub Pages functionality was used to host the final PWA as well as some standalone pages for our internal use (a collection of all our A1 assignments on a single page, as an example).

MS Teams Link

- Click here to access group SEEKS MS Teams profile
- If prompted, use the following Invite Code: **tz3njxj**

Meeting Links

26/12/20 Agenda Recording Actions
30/12/20 Agenda Recording Actions
02/01/21 Agenda Recording Actions
06/01/21 Agenda Recording Actions
09/01/21 Agenda Recording Actions
13/01/21 Agenda Recording Actions
16/01/21 Agenda Recording Actions

***Figure 7** - Snapshot of group SEEKS in a web meeting using MS Teams. © MS Teams 2021*

Industry Data

Job Titles

What are the Job Titles for your group's ideal jobs? How do each of these rank in terms of demand from employers?

Looking at IT Job Titles data *(refer appendix table 7)* provided by Burning Glass Technologies (BGT) shows that from a total of 120,353 job listings made between 24th March 2017 and 23rd March 2018, the top IT job listing was Solutions Architect with 987 listings accounting for less than 1% of the total. A common job title within our group involves Software Developer/Engineer *(table 6),* which in this data accounts for 539 job listings, or just 0.45% of the total listings. When you compare these results to the Top Occupations data *(refer appendix table 8)* provided by BGT, from 121,997 job listings made between 1st March 2017 and 28th February 2018, the top occupation was shown to be Software Engineer/Developer with 29,456 openings, accounting for almost a quarter of all listings made in this period.

This seems to indicate that employers may be having difficulty describing what they are looking for when placing a job opening online. Further to this, data taken from the report 'Skills of Mass Disruption: Pinpointing the 10 Most Disruptive Skills in Tech' (Burning Glass Technologies 2020), states "In the past 12 months, there were 1,714,483 U.S. job openings requesting at least one of the disruptive skill areas." This report shows that the Software Development/Engineer occupation is involved in all 10 disruptive skill areas in demand by the industry.

Table 6: *Demand from employers*

Job title	Demand from employers	
	Job Title	*Occupation*
Alexis Satre Ideal Job - Product manager Job Title - Software Development Manager	<1%	24.1%
Ayub Khayre Ideal Job - Senior Help Desk Technician Job Title – Help Desk Officer	<1%	7.7%
David Egan Ideal Job - VR and AR Engineer Job Title - Senior Software Engineer	<1%	24.1%
Jarrad Elvey Ideal Job - Software Developer / Engineer Job Title – Linux Engineer	<1%	24.1%
Jonathon Seah Ideal Job - Software Engineer (Predication & Insights) Job Title - Senior Software Engineer	<1%	24.1%

Skillsets

From your group's ideal jobs, you can identify a set of skills required for these jobs (we will refer to this as your group's required skill set). These can be divided into general skills (communication, problem solving, writing etc) and IT-specific skills (Javascript, SQL, etc).

General

- Communication
- Problem Solving
- Writing
- Collaboration
- Troubleshooting
- Organisation
- Leadership
- Mentoring
- Planning
- Multi-tasking
- English
- Creative
- Analytic
- Meeting deadlines
- Time management
- Self-starter
- Building effective relationships
- Research

IT Specific

- LINUX
- C/C++
- 3D graphics/engines
- DirectX, OpenGL
- Vulkan
- Video processing
- SDK's
- Motion tracking
- Blockchain
- AI
- Machine learning
- Java
- Haptic devices
- Git
- SQL
- Technical Support
- Python
- Bash scripting
- AWS
- CloudFormation
- Pandas
- Microsoft Windows Desktop/Server
- Microsoft Exchange
- Microsoft Office
- Networking
- VR/AR
- AI
- Simulation technologies
- Project Management
- Customer Service

How do the IT-specific skills in your required skill set rank in terms of demand from employers?

Looking at the data from Burning Glass Technologies *(refer appendix table 10),* our group's skill set encompasses several of the abilities that are in demand. The largest demands that meet our group's IT specific skill set include SQL, Javascript, Microsoft Windows and JAVA. These account for almost half of all IT skills shown to be in demand.

How do the general skills in your required skill set rank in terms of demand from employers?

Looking at our group's ideal job descriptions provides several general skills required to obtain employment within our respective areas. For example, all jobs require communication skills, which also correlates with data from BGT showing that over a third of job listings (36.4%) were looking for someone who can demonstrate this skill. Interestingly, teamwork/collaboration, which would normally be attributed within communication, only accounted for 11.8%. This is most likely due to employers believing that one of these is not exclusive of the other. As a group there were very few general skills not required within our skill set. In fact, the top four skills in our group are communication skills, problem solving, organizational skills and writing, which make up 75% of skills in demand by employers.

What are the three highest ranked IT-specific skills which are not in your required skill set? What are the three highest ranked general skills which are not in your required skill set?

Due to the diverse nature of the jobs chosen by the members of SEEKS, over the course of the 5 jobs the highest ranked skills not required included the following:

IT-specific	*General*
Business Management (6.0%)	*Quality Assurance and Control (3.6%)*
.NET Programming (5.6%)	*Quick Learner (1.4%)*
Oracle (4.9%)	*Project Planning and Development Skills (1.3%)*

Opinions

Having looked at the Burning Glass data, has your opinion of your ideal job changed? Why or why not?

After discussing the Burning Glass data within our team, we found that while certain roles, such as the title of Product Manager sought by Alexis, was not specifically mentioned in the data or that while Ayub's ideal job had a lower demand, that overall, our opinions of our ideal jobs have not changed. This is mostly attributed to the level of discovery we each completed during assignment 1 which involved gaining an understanding of our own skills, personalities, and IT interests.

- *Alexis Satre* - My opinion of a product manager has changed as I was surprised to find that it isn't listed as an occupation, although there were nearly equivalent titles listed including Software Development Manager, Technical Manager and Solutions Designer. My efforts to gain experience might be better directed towards these roles and I would probably even prefer to focus on more defined careers that would be easier to find experience in, particularly Software Developer.

- *Ayub Khayre* - After reviewing the information that was provided my ideal job has not changed. This is due to my current position as a level 1 helpdesk officer. However, looking at the data I can see that the demand for employees for my ideal job is very low (currently sitting at 7.7%). This did make me realise that I may need to widen the scope of my ideal job by looking into other similar sectors that have a higher demand for employees.

- *David Egan* - Reviewing the information within the Burning Glass data has both helped to reinforce my ideal job choice and helped to direct my focus towards a more Software Developer/Engineering focused role. Specifically looking at the list of disruptive skills shown in the report, with a projected growth of up to 135%, and with 30% of skills already requested by employers, opportunities are only going to continue to grow further.

- *Jarrad Elvey* - My opinion of my ideal job hasn't changed after looking at the data. Why would there be a correlation between what is most popular and what is most ideal to me? The most interesting jobs are going to be outside the norm and my stated ideal job was so stated because of the interesting work it would provide.

- *Jonathan Seah* - I believe my choice of ideal job is related to one of the disruptive skills mentioned in the Burning Glass report (machine learning), reading the report has only reinforced my impression that computing technology and AI will be important in the future.

IT Work

IT Professional interview questions

Figure 8: *of Gaurav Suryawanshi by Shaw Innes 2021*

Interviewee: Gaurav Suryawanshi *(pictured)*

Please tell us about your IT work. Who do you work for, your qualifications and what exactly do you do?
A. I work as a full stack developer for Longevum Pty Ltd, a Health tech startup that offers a platform to doctors to better manage patient's health data. I have a master's in InfTech(Business) degree. Most of the time is spent coding on different platforms that are already in use and are in multiple codebases.

What is your schedule like today for example?
A. Work starts at 8 am, ends usually by 5pm which includes 1 hour lunch break. After work is mostly a leisure time.

Please tell us about the industry or area your company is involved in.
A. The company focuses on the health-tech sector. It is a common understanding that one has to visit a doctor to discuss any health concerns that they might have. There is substantial data that shows that these concerns can be symptoms to catch early onset of life-altering conditions and diseases such as diabetes, cancer, BP, cardiac health, or Blood-borne diseases. Innovation and technology can now enable doctors and patients to manage their health in an easier and more maintainable way without an overhead of cost and time.

What other kinds of work do you have to do that might not be in your job description?
A. Other responsibilities include creating and modifying the design files, creating or designing a new user interface.

Who are all the different people you interact with in your work? Please tell us about them. (Are they other IT professionals? Clients? Investors? The general public?)
A. My job requires me to interact with the Manager, Software Devs and Testers. These are usually all IT professionals.

Please tell us about your interactions with other IT professionals within your company and externally.
A. A majority of the time we discuss problems we face and how to tackle them, we start by explaining the problem. perhaps even showing or recreating it. Once the root cause is identified we try to find the first working solution by a verbal discussion. Occasionally any new and interesting finds are also discussed. Apart from that all other interactions are friendly and cheerful.

What do you look for in a job opportunity?
A. Most important factors that everyone should consider before taking up a job is that your interests align with what the job description says. There should be enough growth and learning opportunities in a job for any entry level individual to learn. The culture of the company is also something to consider. This you can find out by speaking with past employees on LinkedIn or through mutual contacts.

Do you have any interactions with clients or investors?
A. None, that is handled by the manager.

What aspects of your work do you spend most time on? What proportion of time do you spend planning/coding/documentation/version control?
A. Every piece of work to do is documented in the form of Jira tickets, planning of the tickets/user stories are done by analysts or managers with occasional involvement from developers like me. Coding takes the most time as it takes time to derive a sound solution to a given problem irrespective of its complexity. Usually, documentation is not needed unless you are editing a library function or creating a utility function to use as deemed necessary. The majority of my time is spent on coding.

Which aspects of your work do you find most challenging and which do you find most enjoyable?
A. Writing sound solutions to a given problem while taking care that the problem won't repeat is definitely the most challenging and enjoyable. There have been times where I've spent weeks on a single task. Delivering on time is always a challenge as there may be some unforeseen issues that need to be dealt with.

Can you share an example of the work you do that best captures the essence of the IT industry?
A. A typical example would be creating a search functionality that searches for entities based on their attributes or relations. Let's say we have a table called 'DOCTOR' and a table called 'PRACTICE' and a many-to-many relationship pivot table 'DOCTOR-PRACTICE' which holds the information of which doctor belongs to which practice. There could be many doctors in one practice, and one doctor could belong to multiple practices. Using the pivot-table we can write an API service that looks up the pivot table and returns the matched results. We could also modify the service to match and return doctors using their name or discipline; or we could enhance it further by matching all doctors in a practice using the postcode.

Once the work is complete, it goes through a number of rigorous tests. Often times a critical bug is found in tests which makes them an important yet underrated process.

Where do you want your career to go from here?
A. I have not decided where I want to take my career from here yet. I see myself working for my current employer for the foreseeable future. For now, I want to advance my career by acquiring skills and knowledge that will make me a better software developer.

What are your biggest tips to new IT professionals and students?
A. To get better at software development, practice coding as much as you can, even make it a habit. Learn the lingo. Know the industry standards, learn coding patterns, the whole process. Keep an open mind - don't let anyone project their opinion about a certain technology on you. Know the pros and cons yourself. Become a self-taught developer - be motivated to keep learning and make time for it.

Is there anything from your workday that you also do at home? Do you have any IT related hobbies?
A. Yes, I do. On weekends I would normally make time for coding, creating a simple project in a new framework in the process of learning it. Reading blogs related to IT has been a hobby for a couple of years now.

How has the pandemic affected how you work?
A. The pandemic made it challenging to communicate and perform daily duties, interact with colleagues. Working from home can sometimes be distracting and not everyone has the same setup to work from home. In my case, my home computer does not have the work environment needed to work from. It is a tedious and time-consuming process to set it all up.

Last time we spoke you mentioned that some of your fellow graduates had found that they weren't getting a lot of mentorship or career development as programmers in some of the jobs they had taken. Can you explain how that works from your perspective?
(transcribed from audio, see appendix Audio 1)

A. Usually, companies that are large companies with different products and different teams have graduate programs, but don't really have mentors. Everything is documented - the process is all documented and they get you to do small projects and themes and progress that way too, but not really have on-product experience or exposure.

That sort of hinders them from even progressing in that company. It might not be a good experience to start that way. It might be better to start at a start-up company and work your way up and understand the whole ecosystem. That's what I do.

Is there any way to know if it's going to be like that before you go into a job?
(transcribed from audio, see appendix Audio 1)

A. That's a really hard thing to find out. But if you go out and speak with previous employees or even graduates who were enrolled in one of the programs, they might be able to tell you the ins and outs. It basically depends on that.

It's your luck, but a safe way is to simply go about that is to find a job at a start-up company or even a normal medium-scale company or business that has less people, somewhere between 10 and 50 and then work your way up amongst their ranks, try to become an intermediate developer there.

That's what I was trying to do initially, but I ended up with another start-up where the product hadn't been launched and it is a good thing, a good place to learn and understand how the business is working. But in reality, you don't want to stick with a company that does not have a product out in the market. You need to be able to have work or have a lot of your experience working on a product that's in the market being used. You'll be able to get good salaries, but in terms of your exposure, it's not really going to help you in your career down the road.

Tips for IT students
(paraphrased from interviewer notes)

When making a side project, park it when you run out of momentum or knowledge and then come back to it with the next set of skills. The more you can document it, the easier it is to include any time as part of a portfolio to show employers. You can use such things as a blog post about how it works or, even better, a comprehensive GitHub readme with installation and deployment instructions. Even add small bug reports in the form of open issues and new functionality. Don't necessarily add all of them at once but some small manageable ones that show you are consistently working on it.

For building a full stack programmer set of skills it's beneficial to create lots of small applications based on different languages, despite what other people and students think of them. For example, PHP has a number of different frameworks that are drastically different, and it is not useful to judge them all based on one. Back-end focused apps are the way to start rather than front end because that is where the majority of the business logic usually is. Java and PHP are common business languages in Brisbane and helpful for employment. Java is a longer learning curve but rewarding and PHP is quicker.

Tips for the team IT project
(paraphrased from interviewer notes)

If you have people in your team who can quickly code a prototype that is a great thing and something to take advantage of. In one of the university projects that I did as part of a team, we spent the majority of the time figuring out how we would do it and documenting what we were going to do but left the coding till very late. The advantage of having something early is that you can all play around with it, see how it works and doesn't. You can also have something more to show at the end if the final product is incomplete or has too many bugs. You just have to be willing to accept a lot of the code might not be useful in the final product, which will probably be started completely separately.

On the other hand, when you start working on the main codebase you want to be able to progress steadily with the whole team on-board. The downfall I had in that university project was that one guy said he'd do all the coding for the back end and in the end it had so many bugs and issues that we weren't delivering a great product and it had gone too far for us to fix. You want to be using tickets from something like Jira or Twilio and then whoever codes it takes it out of a branch with the name of the ticket then creates a pull request that can be viewed, discussed and documented. You want to have someone, or even two people, reviewing pull requests from the main branch before merging and incorporating it and then possibly testing it. When we did the project, it just ended up being me and this guy committing huge chucks of code, smashing it together and creating a big mess that got worse as it grew. You want to work like a team would in a professional IT company with some structure and hierarchy.

When you go for job interview you want to be able to show you know how to work in a team like this. Even if you don't know the language they might be using on their product, you show that you can learn it and, most importantly, that you know how to do this kind of teamwork. You will even have the repo history to show it.

IT Technologies

Machine Learning

What does it do?

Machine learning is a newly emerging field of computer science. The well-known modern formulation uses neural networks to parse information. This concept has been around since the 1970s but has not seen prominence until the last decade as backpropagation / reinforcement learning methods (Rumelhart, Hinton & Williams 1986) were not feasible due to a lack of computer power.

Recent developments with deep learning and computer algorithms have allowed relatively "simple" gradient descent training models to outperform handcrafted AI models that were used in the past (Schmidhuber 2015). This allowed AI methods like perceptrons, generative adversarial networks, recurrent neural networks, and other variations to be trained on large amounts of data provided their structure allows the mathematical description of the network to be differentiable.

Figure 9: *Neural Network, n.d., is licensed under CC-SA*

Perceptrons can now perform image classification, for facial recognition, optical character recognition and even video classification. Recurrent networks perform natural language and audio processing. Generative adversarial networks can create images from seed data or even just a description.

In 2016, Deepmind's AlphaGo program won a match of Go against one of the world's best players without handicaps, paralleling DeepBlue's victory over Kasparov in chess (Boroweic & Lien 2016). The game of Go requires viewing large areas of the board to determine the value of moves, being infeasible for directly evaluating a game tree. This was a demonstration of the progress perceptrons had made.

Now machine learning can perform simulations of computationally expensive fluid flow (Sanchez-Gonzalez et al. 2020) in real time, allowing better and faster simulation of interactive environments for games and for research. The greatest importance however is the ability of the algorithm to generalize from simple training datasets to complicated environments. Similar qualities were observed with the AlphaGo program, later remade as AlphaZero to generalize to more than just one type of game, indicating the potential for deep learning to generalize out of its training data.

Other applications include detecting breast cancer (McKinney et al. 2020), even to the level where machine learning algorithms can aid doctors in improving false positive and false negative rates by five to ten percent. The results are even generalizable from a training data obtained in the UK to patients in the US. Similarly, work on pneumonia detection in x-rays has achieved accuracy on par with professionals within limited contexts (Rajpurkar et al. 2017), pointing to a potential for machine learning algorithms to interpret medical data.

Along the same lines, there is also work towards improving medical diagnosis accuracies from overall patient data and not just in a single domain (Razzaki et al. 2018). While accuracy there does not match medical professionals, there is still much development in the field that could improve results.

A third application is controlling walking robots able to navigate difficult terrain. In this example, a blind robot with only internal sensors manages to navigate irregular terrain, snow, water and even plants. This also generalizes to loads and crumbling terrain. Having piloted test robots in the real world, the algorithm promises to allow better locomotion for robots. Self-driving cars *(fig. 9)* are also a related field of work that is advancing rapidly and the problem of transporting an object or person from one place to another may well soon have an automated solution.

These advances have allowed automation to reach large quantities of data or actions that were previously not feasible. Advertisers can now classify vast quantities of usage data, video and picture sharing websites can sweep through submissions with an artificial eye, and even songs or speeches are available for parsing.

Likely Impact

These developments show that machine learning has the potential to change everything, being a fundamental improvement in automation. Any problem that repeats itself, requires interpretation of data or a feedback loop of sensory data to actions, is potentially solvable by machine learning. As long as the desired behaviour can be trained in an agent, machine learning can allow tools to automate the process.

***Figure 10**: Self Driving Car concept, n.d., is licensed under CC BY-SA*

As they say, this time is different. The machine learning powered automation does not have to be better than humans, it just has to be more cost efficient. Computers are significantly cheaper than people. If a job is automatable, then it is likely that at some point in the future, those jobs will be mostly automated. These range from self-driving cars pushing out taxi or trucking services to website article generation from prompts or video footage reducing need for article writers. Jobs as far ranging as radiologists to lawyers might well be affected by automation.

The taking over of existing tasks is not the only impact, however. The extension of capabilities to parsing large quantities of data is likely to open fields that were previously too expensive or too difficult. This includes scientific research, like weather modelling and protein folding (Senior et al. 2020), which may provide new tools whose impact is hard to predict. What is likely is that the new tools provided to researchers from machine learning will only increase the speed of technological development. Machine learning has even reached the levels of government policy and national security, with predictive modelling of earthquakes to crop yields (Mignan & Broccardo 2019; van Klompenburg, Kassahun & Catal 2020).

Overall, the impact of machine learning is to make our tools smarter and applicable to more areas than just a narrow range of physically simple tasks.

How will this affect you

For an immediate impact on our personal lives, I would expect to see far better computer graphics, including complicated light source simulations (Zhang et al. 2020) or repainting scenes from photographs (Martin-Brualla et al. 2020). Videos and games become more realistic, simulation and augmented reality become better and more feasible.

Machine learning could also lead to improvements in healthcare outcomes, better matching of products to consumers, jobs to jobseekers, or possibly even government policy to outcomes (Zheng et al. 2020).

Any data driven process that is left to the machine learning algorithms may well be able to personalize actions to the user on a category of far greater resolution than any human driven system could. We are already seeing this process happen for internet advertising and their consumer data, the same could happen for healthcare or other fields too.

As machine learning technology matures over time, it promises to increasingly apply automation to every aspect of work and life. From helper robots for the infirm to augmented reality applications, it is hard to say where the limit might be.

Natural Language Processing and Chatbots

What does it do?

The idea of chatbots and its necessary requirement of natural language processing has been around since very early in computing history. The Turing Test is a famous, if incomplete, test that asks if a computer can successfully pretend to be a human through a text interface (Turing 1950). Other uses for natural language processing involve customer service, interpreting and answering questions, translation and text recognition. While the Turing Test is simple and not nearly sufficient to prove strong AI, passing a Turing Test has proven extremely hard.

One of the chief challenges facing natural language processing is long term dependency. Simple chatbots that depend on older models of natural language parsers like Markov chains or recurrent neural networks quickly run into scaling issues when attempting to 'remember' large quantities of past text (Kolen & Kremer 2001). Thus, they meet problems staying relevant to the topic when generating text, the problems become obvious when they are asked to go on for longer (Liu, Baldwin & Cohn 2017) (Lin, Bendit-Shtull & Spinner n.d. 2020).

Another challenge is one of context and interpretation. Humans naturally embed context into their language and use the context as well as common-sense to interpret what is said. Winograd schemas are one example of ambiguous interpretations requiring some knowledge of the world in order to successfully understand (Ackerman 2014). An example of such a sentence is: "The trophy doesn't fit in the suitcase because it is too large/small", where the "it" word can refer to either the trophy or the suitcase depending on the last word. It requires being sensitive to the language's context and some common-sense to know that "fit in" implies a size restriction. Building or training such understanding into an AI is extremely hard (Wang et al. 2019).

These challenges have been partially met in recent times.

IBM created Watson to field open questions and used it successfully to play a game of Jeopardy in 2011 *(fig. 10)*. Jeopardy is a quiz show requiring the player to interpret questions asked in natural language and reply with answers in natural language (Murdock 2011).

***Figure 11**: IBM Watson on Jeapardy, 2011, is licensed under CC BY-NC*

BERT is a language model that was developed by Google in 2019 and has scored about 85% accuracy on an expanded Winograd schema challenge (Devlin et al. 2019) and similarly on other language processing benchmarks. It achieves such proficiency through the use of Transformer architecture that solve the problem of long-term dependency (Vaswani et al. 2017).

Similarly, GPT-3 is also built on Transformer architecture by OpenAI (Brown et al. 2020) and has captured public imagination with its ability to generate text, answer philosophy questions (Weinberg 2020), create website code from descriptions, summarize long texts and many other functions besides.

> *Both tools take only 60ms + of GPU fetch time over standard JVs for training one machine while using very modest network configuration under typical case load (1000 input tokens by one token machine) where they show good ability working with very noisy environments to handle even high complexity datasets.*

The above is the continuation of this essay by GPT-2, the earlier and smaller predecessor of GPT-3, given the entire text above it. The demonstrated coherence even over a very long sentence and sensibility is impressive for machine generation and nearly matches state of the art.

As GPT-3 does not differ much from GPT-2 except in size, and yet does not demonstrate that its size is starting to yield lower benefits, it is certain that in the short term, the continued scaling in complexity and data of models like GPT and BERT will proceed.

As the outputs are already becoming human-like and the systems become yet more capable, there is the possibility that such natural language generation systems may significantly improve machine translation, voice recognition and even automated question answering services in the near future.

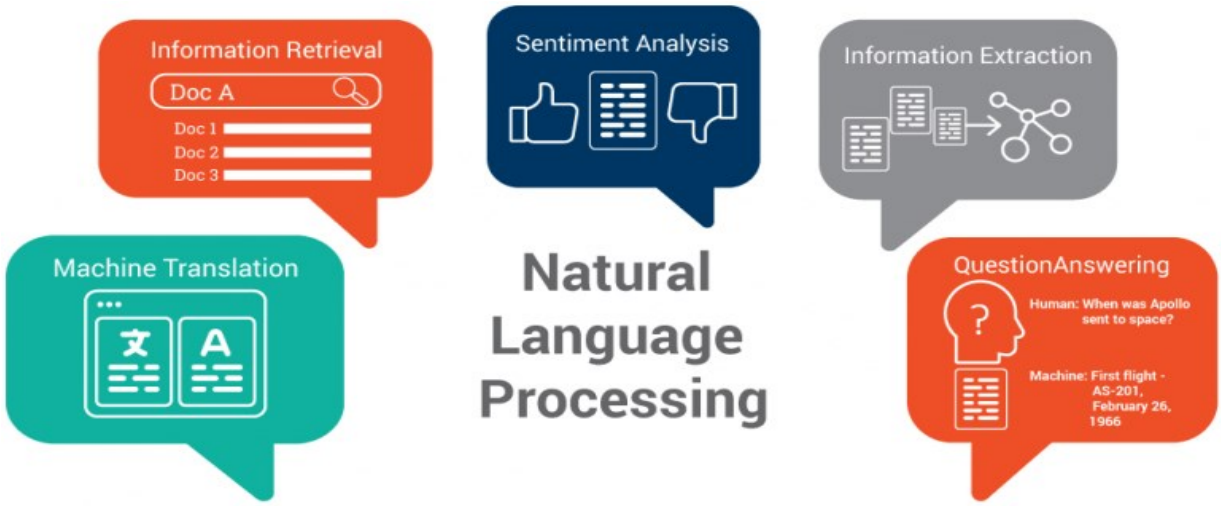


Figure 12: *NLP Components, n.d. is licensed under CC BY-NC-ND*

What is the likely impact?

Natural language processing serves as the interface between the rigid digital world of computers and the more flexible context dependent communication of humans. Having the ability to parse or generate text, natural language processing could let AI cover far more areas where humans currently have to work in.

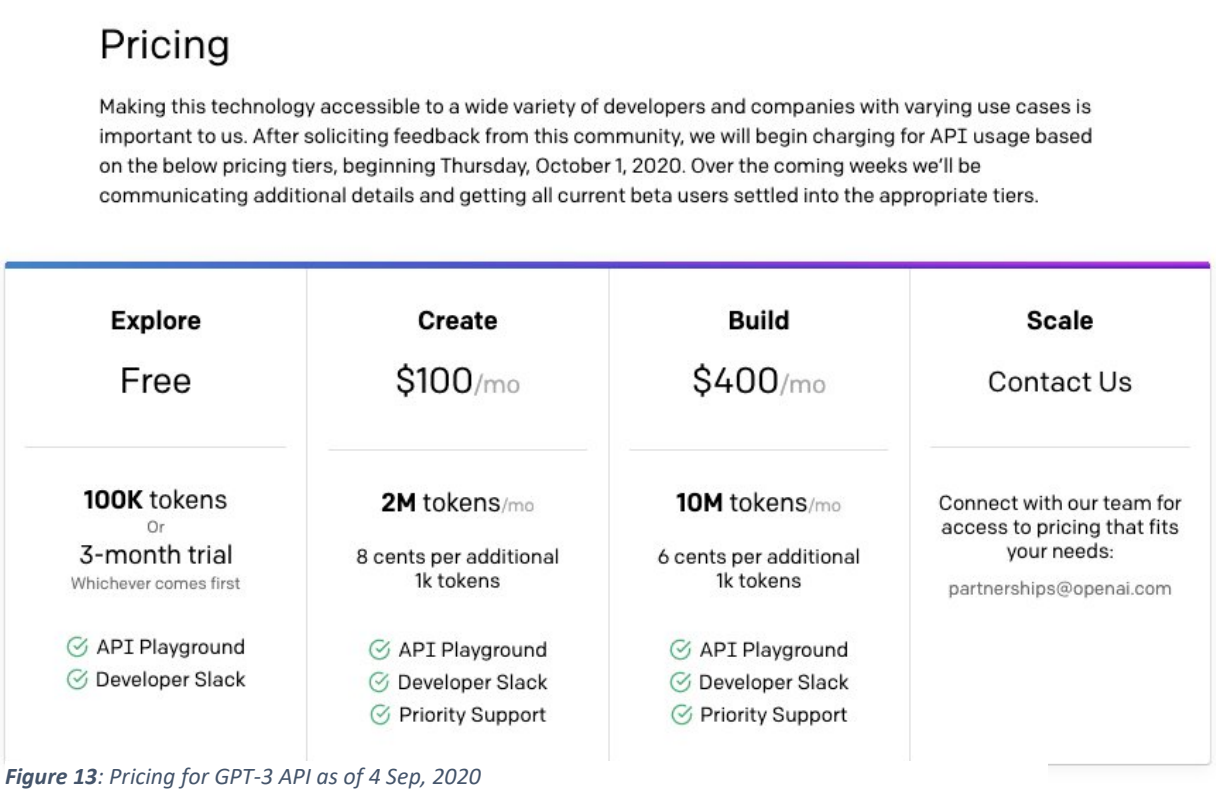
Language models can already generate magazine articles and blog posts that pass human inspection (Hao 2020), financial reports and election coverage has also seen AI generated content (Martin 2019). Natural language AIs can summarize information, generate stories and pick out images and movie scenes with the desired sentiment. In many areas, such language models are poised to replace human labour where new content is not required. For now, however, the usage of natural language AIs in industry is limited to being human assistants and data summarization.

Consumers and producers of such content will be affected by such changes. Producers might find their jobs changing, where they serve to write prompts for AI content generation or fine-tuners to choose relevant articles for the computer to parse and serve as the well of content from which it draws. In the near future, we might find scientific literature review written by bots, search engines able to answer questions posed in natural language and even legal documents written by such natural language generation.

How will this affect you?

More disturbingly is the potential wave of AI generated content that consumers might have to increasingly wade through on the internet. Natural language processing allows computers to generate “fake” content that can fool humans into treating them like other humans (Douglas 2020), opening the door to bots pretending to be humans well enough that they can be used to spread disinformation or pretend a group is more numerous than otherwise.

Curation against disinformation and trust on the internet might well be severely impacted by such a deluge. Efforts by humans to curb such “spam” could be quickly overwhelmed by AI generated content from malicious actors, chatbots have no need of sleep and their running cost is cents per page *(fig. 12)*



Pricing

Making this technology accessible to a wide variety of developers and companies with varying use cases is important to us. After soliciting feedback from this community, we will begin charging for API usage based on the below pricing tiers, beginning Thursday, October 1, 2020. Over the coming weeks we'll be communicating additional details and getting all current beta users settled into the appropriate tiers.

Explore	Create	Build	Scale
Free	$100/mo	$400/mo	Contact Us
100K tokens Or 3-month trial Whichever comes first	**2M** tokens/mo 8 cents per additional 1k tokens	**10M** tokens/mo 6 cents per additional 1k tokens	Connect with our team for access to pricing that fits your needs: partnerships@openai.com
API Playground Developer Slack	API Playground Developer Slack Priority Support	API Playground Developer Slack Priority Support	

***Figure 13**: Pricing for GPT-3 API as of 4 Sep, 2020*

For now, the cost of training models like GPT-3 run into millions just from the compute costs alone. The amount of programming expertise is also a large barrier in such experimental systems. Yet the inevitability of decreasing compute costs promises that such issues will be resolved sooner or later; not to mention that such costs are small by the standards of large corporations or governments.

On the positive side, natural language processing could allow computers to interface better with human communication, allowing AI assistants to be 'smarter'. Less computer literate people could have far more accessibility than before, as such systems might be able to understand natural language commands rather than requiring some level of functional knowledge of computers to operate.

The increasing reach of AI into the domain of human language thus allows greater automation of every portion of human interaction that relies on said language.

Virtual Reality

What does it do?

Virtual Reality (VR), the ability to experience a virtual world, has a rich history which has come a long way from early visions. In the 1830's Sir Charles Wheatstone, after conducting research into binocular vision, created the Stereoscope, allowing the viewing of two images (one for each eye) taken from different angles, giving a 3-dimensional (3D) effect when viewed with his invention. It would be almost 130 years later that cinematographer Morton Heilig would create what is considered the first VR machine, the Sensorama in 1956 *(fig. 13)*. This device built upon Sir Charles Wheatstone's research and used cutting edge technologies (for the time) to create an experience that combined audio, 3D video, vibrations, and even smell to create what he called the "cinema of the future" (Barnard 2018).

Figure 14: *The Sensorama (VirtualSpeech 2019)*

It would take another 60 years after the Sensorama before VR would start to truly become a technology that you could use in our own home. In fact, the term 'Virtual Reality', was not coined until 1987 by programmer Jaron Lanier (Barnard 2018).

Figure 15: *HTC Vive released in 2016 (VirtualSpeech 2019)*

The VR we use today is much smaller than Heilig's device (thankfully), and consists of a headset, either stand-alone, attached to a computer or even to a PlayStation console and will typically include controllers used to track movement *(fig. 14)*. The headset is able to track a user's head movements to help convince the brain it really is in another 'virtual' place. This is achieved by displaying immersive 3D images through the headset to each eye from different perspectives, just like Sir Charles Wheatstone was able to demonstrate in 1838, and takes this further by enabling a 360-degree view.

Some current applications of VR include Psychologists helping their patients to overcome phobias, such as fear of heights, by letting them experience and overcome their fear without risk to their safety (Mihai Andrei 2019). Melbourne Water, a company that admittedly does not first come to mind when thinking about VR technologies, is employing VR to help train staff in a safe virtual environment. Working closely with Deakin University, they co-created the world's first VR training program for snakebite prevention and first-aid training. (Cooper 2019; Melbourne Water n.d.).

One of the top adopters of VR technology has been the healthcare training industry with a forecasted revenue of $2.4 billion by 2026, up from $216 million in 2018 (Marbury 2020). One of the primary uses of VR within this industry is for surgery simulation which allows for the recreation of an operating room in a virtual space, providing surgeons a safe environment to gain skills and competence levels. You can view an example of how this works in this video (2 min) from virtualmedicalcoaching.com which shows a student practicing radiography in a safe virtual space. They can also simulate emergencies such as accidents involving multiple patients or disease outbreaks (ScienceSoft 2020).

One way in which we are likely to see VR change over the next several years is the continued blurring of lines between technologies into what is being called Extended reality, or XR for short. XR involves a combination of Mixed reality (26%), Augmented reality (36%) and Virtual reality (38%) to achieve such a realistic virtual space that incorporates the real world in such a way as to be seamless enough that you cannot tell the difference. Augmented reality (AR) relies upon a device, such as a phone and overlays synthetic content over what the camera is seeing. Mixed reality (MR) enables the blending of AR and VR enabling both physical and virtual elements that can be interacted with. XR takes these technologies further by bringing all these tools together, as well as utilising all future reality technologies. XR seeks to create a reality where you can suspend disbelief and believe you are truly in a virtual environment, referred to as the holy grail of VR (Rogers 2017). Frontiers in Virtual Reality (2020) describe XR as an '… enhanced visual realism that is increasingly facilitated by stereoscopic vision, head tracking and eye tracking to attain synchronization with the person's eye movements … '.

XR technologies are being made possible by advances in tech such as 5G with its high bandwidth and low latency, artificial intelligence and machine learning (see Machine Learning) and of course AR and VR (Greig 2020; Scribani

2019). The low price of these technologies is also enabling students to begin experimenting earlier and earlier, with an average price of an Oculus Quest at around AU$479 (https://www.oculus.com/compare/). In an interview with Medical Futurist (2019), VR expert Robert Scoble believes that over the next few years we are likely to see workers within many industries take advantage of these technologies. The medical industry is likely to be highly impacted, with doctors being able to setup a diagnosis while enjoying a coffee at their local café, all while looking at virtual screens with their patient's data. In fact, this is being made a reality with products such as Vodafone's new augmented and mixed reality glasses (Geary 2020). Vodafone says that this technology, which is already available, allows you to " … seamlessly blend real-world and digital content while you interact with virtual 3D objects … ".

What is the likely impact?

The impact XR will have within industry will be far reaching and will change how we communicate, how we work and how we experience the world. With XR potentially allowing us to taste and smell in a virtual world (Marr 2020) this will only be the beginning.

Manufacturing

XR will start to see wide use in product design, a place where attention to detail is key to success. XR will be able to bridge the gap of visualising heavy equipment by enabling workers to actually see and use a final product. Ford motors is already starting to use Ford Immersive Vehicle Environment (FIVE) VR/XR technology so that engineers can see how the interior appearance of a car will turn out without having to create physical artifacts, cutting manufacturing time by weeks. It is estimated that the use of XR technologies will deliver a staggering $360 billion dollars within the manufacturing industry by 2030 (Thomas 2020).

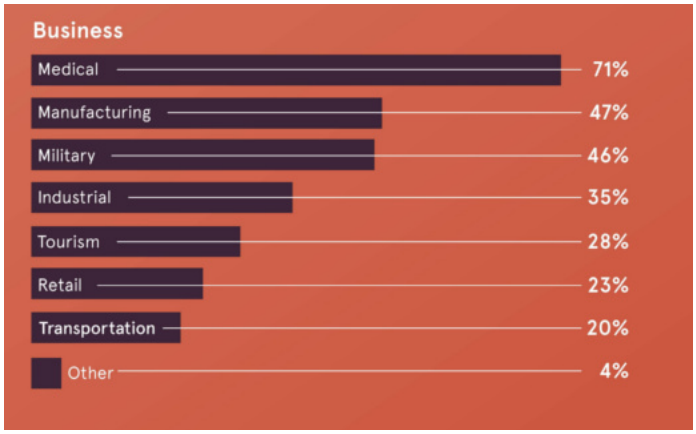


Figure 16: *Top industry use for XR (Scribani 2019)*

Tourism

The global travel industry's contribution to GDP in 2019 was estimated to be $2.9 trillion US dollars (Lock 2018), with the impact of coronavirus set to drop 17% off global revenue over 2020, and effects of this are likely to last far into the future. XR will enable the industry to grow in ways that are currently unimagined, without your having to physically travel or even leave your home or business. How about a visit to Mars during your lunch break or a quick trip to check production lines in your overseas warehouse (Scribani 2019). Whilst unlikely that people will stop travelling to their favourite destinations, tourism is unlikely to recover to where it was before the pandemic, and if the industry wishes to reduce impact on GDP contribution it will need to understand XR technologies to ensure survival and begin to transform what tourism means to the world (Kwok & Koh 2020).

Other impacts may be more personal. A survey conducted by the University of Sydney business School's Institute of Transport and Logistics Studies (ITLS) found that 75% of workers believe that working from home will become the standard over time (Booth 2020). We are already seeing a rise in VR events and meetings (Bajarin 2020) which is enabling people to stay in contact like never before and XR will only cement events like this further by making them more interactive by utilizing XR technologies. Further, a study conducted by the University of Barcelona (Slater et al. 2020) with participants including representatives of major companies and institutions such as BBC R&D, Digital Catapult, Dimension /Hammerhead VR, Facebook London, NESTA, Jigsaw (part of Google), Magic Leap, Microsoft Research, and University College London found that people will struggle to separate real world and virtual world experiences, potentially having significant impact on cognitive, emotional and behavioural regulation. For example, you may not realise what 'reality' an event took place in, anger at your avatar being insulted by a fictional character or realising that actions acceptable in XR are not being acceptable in the real world.

How will this affect you?

A video created by Keiichi Matsuda (2016) titled Hyper-Reality (http://hyper-reality.co/) (6 mins), shows how as a result of our virtual and physical realities becoming more and more intertwined, we will begin to see a world where they are no longer considered different. A world where even our walking outside will be personalized for us, with advertisements and personalized products appearing right there for us to interact with using all of our senses.

As XR begins to meet its full potential I feel that it will have a positive effect on me. Job opportunities all over the world will become available. I already conduct many interactions over the internet and the ability to physically meet and interact with friends on the other side of the world will be invaluable, especially as impacts from coronavirus show no signs of going away anytime soon.

With the rise of XR I will have more time to spend at home with my family, more time to experience the world in ways I did not think possible. My largest concern will be the security of such technologies. How will I prevent someone making a 'copy' of my digital self? As shown in the article The Ethics of Realism in Virtual and Augmented Reality (Frontiers in Virtual Reality 2020), ' … With superrealism it will be possible to make virtual "copies" of people that look, act, talk like a real person, even demonstrating aspects of personality (for example through the use of machine learning applied to behaviour based on recordings of the real person)… '. How we ensure the security of this technology will determine its success and its direct impact on us.

Blockchain

What does it do?

Blockchain technology offers many different opportunities to people, organisations and governments, but, fundamentally, it is an immutable sequential ledger of any data type, protected from tampering by a combination of encryption and (in the case of public blockchains) economics.

History

Bitcoin was somewhat of a cultural reaction to the general expansion of crony-capitalism in western society and the ever-increasing surveillance and control of governments over citizens. The 2008 financial crisis, in particular, brought this starkly into focus for all citizens of the world.

The Cypherpunks were an international group of liberal and often libertarian computer and cryptography enthusiasts from around the world who communicated on the internet. Along with many other citizens and organisations, they viewed the unethical lending, trading and government bailouts as criminal theft of money from the citizens by their governments and financial corporations. They also found the government's fractional banking systems and the government's financial instruments to be unethical and unbeholden to the citizens they should serve. (“Anticapitalism and the Cypherpunk Movement – Subverter” 2017).

Figure 17: *Dealer Wins Again by Nick Anderson 2010*

Cypherpunks also saw a great need for privacy in the modern, global, and interconnected world. This is reflected in the following quote, *“Privacy is necessary for an open society in the electronic age. Privacy is not secrecy. A private matter is something one doesn’t want the whole world to know, but a secret matter is something one doesn’t want anybody to know. Privacy is the power to selectively reveal oneself to the world.”* (Hughes 1993).

This niche and underground social movement led to the creation of Bitcoin in 2008, the very same year that banks were being bailed out by governments around the world (“The Cypherpunk Movement” 2019).

This whitepaper (authoritative report) and first transactions were made by the pseudonym Satoshi Nakamoto leading to the world having its first true digital currency, which is completely untethered from any currency reserve or physical assets. It is also completely independent from governments or corporations. Bitcoin drew on previous technology from digital currencies, cryptography and the ‘Cypherpunk’ movement, however, Nakamoto made a revolutionary step and drew all these ideas together in a powerful, coherent creation (Nakamoto 2008). The value of Bitcoin and contemporary competitors have significantly exploded since the creation of this currency. Today, crypto currencies are a part of the global vocabulary and are considered by leading institutions a financial asset class in their own right.

Independence

Inflation and monetary expansion reduce the wealth of individuals who use a currency. Bitcoin, in contrast to fiat (dollar) currency, cannot be printed, issued, or debased by any central authority and therefore it cannot be artificially inflated as it is entirely decentralised. Meaning it operates on the consensus of all the nodes (people or organisations) participating (Song 2020).

Diversity of features

Subsequent blockchains have added different features or behaviour by changing the fundamental algorithms that run and secure a blockchain. Blockchains can now operate in almost any sector. Although it isn’t completely integrated there is promise in healthcare, logistics, art dealing, capital raisings, democratic systems and financial

technology. It has only been made possible by the advancement of modern public-key encryption, economics, and computing technology.

Mathematical trust

Blockchain products are advantageous because they require minimal agreement and trust between parties other than the algorithms and math that underlie the technology. There is no way bitcoin can be counterfeited and it is extremely difficult to reverse any transaction or 'double-spend' bitcoin. Additionally, there is less need for long term trust-building between institutions before they are willing to transact across borders with social and legal differences. Blockchains cannot be debased or artificially inflated to benefit specific industries during international trade. There is almost no way for instability such as government upheaval or criminal actions to undermine the integrity of a blockchain.

What is the likely impact?

Strengths	Weaknesses
▪ Distributed resilience and control ▪ Decentralized network ▪ Open source ▪ Security and modern cryptography ▪ Asset provenance ▪ Native asset creation ▪ Dynamic and fluid value exchange	▪ Lack of ledger interoperability ▪ Customer unfamiliarity and poor user experience ▪ Lack of intraledger and interledger governance ▪ Lack of hardened/tested technology ▪ Limitation of smart contract code programming model ▪ Wallet and key management ▪ Poor tooling and poor developer user experience ▪ Skills scarcity and cost ▪ Immature scalability ▪ Lack of trust in new technology suppliers
Opportunities	**Threats**
▪ Reduced transaction costs ▪ Business process acceleration and efficiency ▪ Reduced fraud ▪ Reduced systemic risk ▪ Monetary democratization ▪ New business-model enablement ▪ Application rationalization and redundancy	▪ Legal jurisdictional barriers ▪ Politics and hostile nation-state actors ▪ Technology failures ▪ Institutional adoption barriers ▪ Divergent blockchains ▪ Ledger conflicts/competition ▪ Poor governance

Figure 18: *SWOT for Blockchain by Upadhayaya, Sharma & Arun 2017, p. 12*

Blockchain currencies have the potential to become a major technological tool in many industries.

Organisational Transparency

Record keeping and auditing will be streamlined and all changes to data will be recorded. This could dramatically reduce the likelihood of embezzlement from companies and governments if they chose to secure their funds and record keeping with blockchain technology.

Smart contracts

Creating commercial digital agreements (smart contracts) within a blockchain means less need for costly risk reduction measures like financial intermediaries, escrow accounts and arbitration. Smart contracts can also require a confirmation from multiple parties to complete transactions.

Micro-scaling Finance Products

Any person requiring the smallest of transactions can use blockchain. Blockchain can offer substantial cost savings and, therefore, entrepreneurial opportunity, to companies or people who would typically operate transactions on a scale too small for existing financial institutions to work without huge fees (Upadhayaya, Sharma & Arun 2017, p. 92). Western Union money transfers is a typical example of this as it is incredibly costly for individuals to

send money to relatives worldwide because each customer cannot coordinate with other customers to reach a scale large enough to either negotiate or find competition. Blockchain avoids the need to coordinate and even use such financial products as it is international by default. Each user only needs to concern themselves with converting blockchain currencies to and from the local currency.

Millions of people worldwide have no access to personal banking but have access to a smartphone. Blockchain offers the possibility of enabling these people to participate in their economies in ways previously impossible. They could take loans, save money securely, prove their identity and own property without the onerous bureaucratic banking and government systems that are often corrupt and too time-consuming in developing nations. (Hernando De Soto, Hudson & For 2001)

Data

People can use a blockchain to store any data that they wish to make public and permanent. It can also store encrypted or sensitive data. Whistle-blowers could share leaks directly to the blockchain, making their leaks immutable and public at the same time.

Providence

Blockchains can also include a series of signatures that proves who has possessed or transferred a physical product of any kind.

How this will affect you

The rise of blockchain will not only affect myself but also the greater global economy, I believe that this will affect:

My identity and personal records

With the anonymity that blockchain provides I will have greater control over my identity and personal data. Everything from driving licences, registration, medical records, rental records, references could be stored securely and encrypted on the blockchain in a way that the I could control.

How my Healthcare information is stored

With the secure encryption that blockchain provides, I believe I can securely share my healthcare information with organisations, for an example of this please refer to the following diagram:

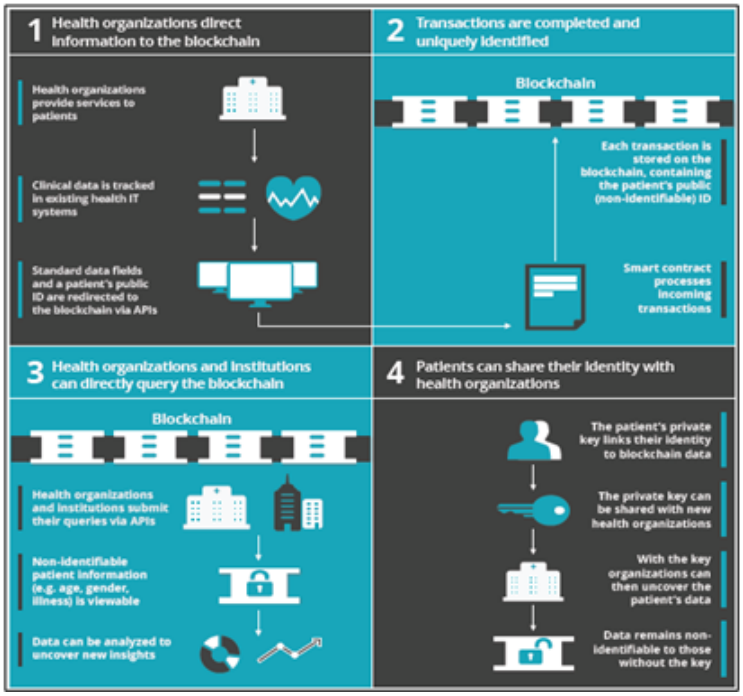


Figure 19: *Blockchain Healthcare Benefits by Upadhayaya, Sharma & Arun 2017,*

My Personal Banking

As previously discussed, personal banking may become dramatically different as we become used to holding different currencies, creating smart contracts, or actioning international transfers without so much as a second though. We may be able to access a market of different loan providers at our fingertips. These providers could then access an anonymised summary of all our financial records instantly when we apply for a loan.

Project Idea

Overview

You can now quickly compose repetitive sentences with ease and speed.

RoboWrite is a cross-platform application (app) that will create full sentences based on selections from a user-defined form. The user can select key-words to finish a sentence or even choose entire sentences. Each template is fully customisable.

The app automatically copies the results for the user to paste in another app or document. However, the user can also view and modify results and save or share it anywhere.

Motivation

Health professionals, psychologists and physiotherapists write reports on patients daily. These often follow the same structure, resulting in hours of wasted writing time. Repeat sentences are usually about the symptoms, appearance and progress of a patient. For example:

Physiotherapy

- The patient's knee was extremely painful on *extension and walking*.
- The patient had *70%* range of motion.

Psychology

- The patient looked *tired* and had *low energy*.
- Mr X appeared *well-groomed, prepared and rested*.
- His mood appeared *stable and moderate*. His speech was *talkative and coherent.*

Radiology

- There is *oedema* on the *tibial plateau*.

Often only one or two words will change in these types of sentences over the different patients.

There are no apps available to the public that can quickly automate repetitive sentences and there is demand for a product like this (Evan 2020, pers. conv., 11 December).

Potential User Base

There are over 25,000 members of Australian Psychology Association and 29,000 members of the equivalent Physiotherapy Association (APS 2021; APA 2021). There are also approximately 20,000 practising counsellors in Australia (Keast 2017). Medipeople ("Radiologist Salaries in Australia & New Zealand" 2018) estimates that over 2000 radiologists work in Australia, and with most radiologists making use of competing technology (with voice recognition), this app will still be useful if it provides superior customisation.

Threats

Risks

There is a risk that after releasing the app, other companies may create imitation products. Experienced developers could achieve this quickly due to the simplicity of the app. It would be best to avoid this by developing a **strong brand** with adequate trademark protection and fostering a good relationship with the user base.

Competitors

There are currently no publicly available competitor products that the team can find.
There is a Microsoft word extension used for marking within an Australian University. ("Norfolk" 2021) It includes comment banks as a feature, but it is private, so we are not able to assess it.
There is at least one, and likely more, private radiology applications that use voice recognition, discussed below.
It would be desirable to **differentiate** this product from voice recognition transcription applications, such as radiologists use. This kind of software is prolific in various forms, and there would be more consumer demand for a different niche.

Existing Use Case

Karisma

Karisma (https://www.kestral.com.au/solutions/karisma/) is a Radiology Information System developed by Kestral Computing Pty Ltd and is used by the Radiology department at the Royal Melbourne Hospital to manage patient information in the department. The application performs scheduling, tracks appointment information, patient alerts, reports and accounting for payments.

In almost all workflows, Karisma provides a field for notes made against various data entities (patients, services, letters, payments) which allow a function known as Report Templates. These are a shortcut combination that allow for quick pasting of a pre-defined and formatted block of text into the currently open notes field. Templates are used for radiologists to quickly insert formulaic report content, for reception staff to insert appointment letter content and for nursing staff to leave important medical alerts for patients.

Example Workflow

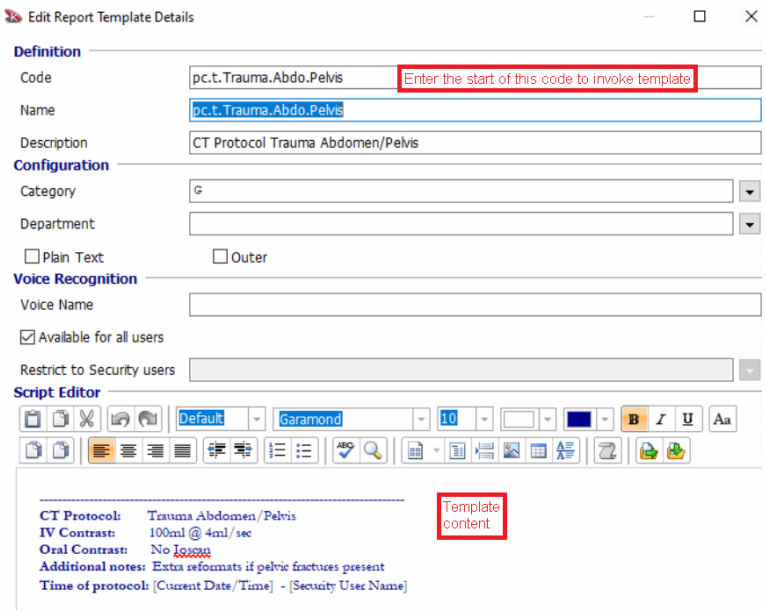


***Figure 20**: Karisma window used to create a Report template. © 2021 Kestral.*

Figure 19 above shows the Karisma interface window in which a user might configure a template to be used for later. Example shown is a Protocol for a trauma scan.

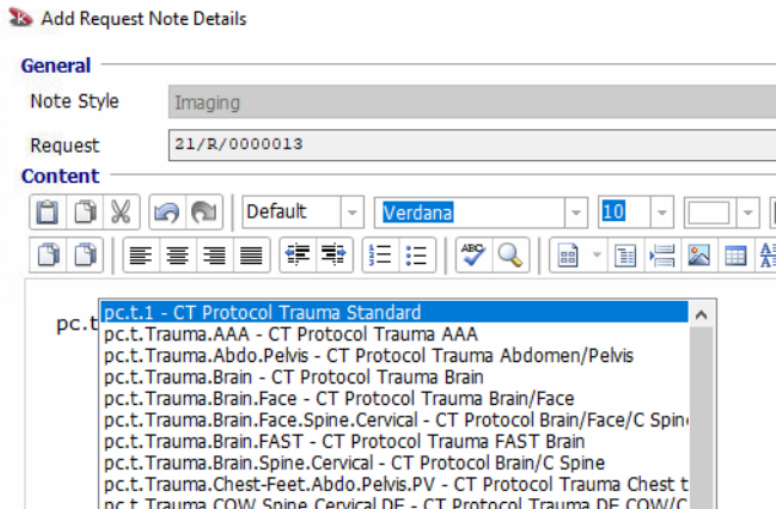


***Figure 21**: Invoking a template in a note field within Karisma. © 2021 Kestral.*

Karisma allows entering a partial match to the code, "pc.t" *(fig. 20),* followed by the hard coded shortcut combination Crtl-Space that displays a list of all templates that match the code given. Typing "pc.t.T" would exclude the first entry from selection.

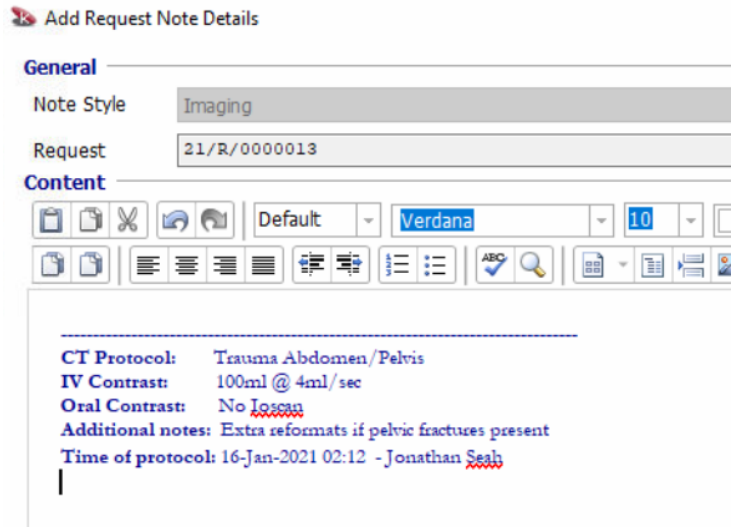


Figure 22: *Inserted Template in Karisma. © 2021 Kestral.*

After inserting the template *(fig. 21),* it becomes normal text that can be edited. Of note is the wildcard field that has replaced the [Current Date/Time] with the current date and time, and the [Security User Name] with the current logged in user's name.

Flaws

- Limited to in-application use only. The function is built into Karisma and not available in other patient information systems, such as the hospital-wide systems like iPM and EPIC.
- Templates are not shared between applications outside of Karisma; current existing problem in the department relates to Nursing staff being unable to use templates for notes in EPIC to record the same patient alerts; EPIC does not have a freeform templating system.
- Method to invoke templates are long and convoluted causing a potential training issue.
- Proliferation of many customized templates used by different staff; some radiologists utilise personally written templates customized for their own individual use causing difficulty in standardisation.

SWOT Analysis for RoboWrite

Strengths

The project can progress steadily from a minimal and manageable MVP towards a more feature-rich product. There are no new technological leaps required to create the app. It is merely automating a common task.
Additional strength is that team members could apply the learning experience from creating this to similar text-based apps.

Weaknesses

- *Simplicity:* It may be challenging to create a strong value proposition for customers because it is a straightforward app.
- *Speed:* The app must be very responsive and user friendly for users to benefit. The app will not get strong adoption if it is slow or cumbersome in any way. Developers must minimise user actions to get the output to where it needs to go for the user.
- *Codebase:* As a consequence of its simplicity, it would be an out of proportion amount of effort to produce codebases for all possible platforms, especially without being sure what platforms users are likely to use at this stage. The team will avoid wasted effort by either focussing solely on one platform that is most likely to be used (Web or iPad) or spending a reasonable amount of time finding a means of delivering the app to as many devices as possible from the one codebase.
- *Security:* JavaScript projects that incorporate many technology layers are known to be more challenging to secure. Using a framework (or native app) would mean the project automatically gains the provider's security features. This use would not absolve the team from security responsibility but would substantially reduce the time spent focussing on security in the early stages. (Ionic 2021)

Opportunities

Future funding and monetisation could come from:

- *App sales:* Users ideally could try free for one week and then need to pay a once-off fee or small subscription. Mobile app store distributions incur high fees – 15% for Apple App store. (Leswing 2020)
- *'Freemium' purchases:* The app could require a purchase to unlock the open/save feature, allowing the user to experience the app before paying for the major feature. iCloud or similar sync could be a further paid feature.
- *Licencing:* The team could licence desktop applications to services that bundle apps for subscription fees such as SetApp. Hospitals or centres might pay annual licencing fees if this allowed them to modify the app to suit them or pay for the further development of features they require.
- *Sponsorship:* Professional organisations such as APA and APS mentioned above might sponsor development in return for member discounts.
- *Crowdfunding:* This would involve offering discounts to pre-purchase the software (or additional features) and probably require free and paid promotions through social media. By getting prospective users to pay in advance for specific features, we would get the most accurate information about the order of the features we should implement. Crowd-funding also increases awareness of the app from the regular viewers of a crowdsourcing platform. The main risk is that it will present poorly to the public if it fails to reach a funding goal. It is also uncertain if this campaign will reach enough buyers relative to the low cost of the app. (App Partner Academy 2018)
- *Donations:* Users would have an in-app option to donate money to develop the app, including future support and features. Developers could encourage users by displaying a discrete but persistent popup or toolbar until the user donates.
- *Open-source:* The team might continue development by harnessing other programmers' volunteer time and interested people by making the app available on a public repository.

Description

The app will be a basic three-page application that consists of:

Minimum Viable Product (MVP) features

- *Setup page:* A page where a user can set up the tick-boxes and the sentences to go with them. The user will type in the leading text for each tick-box series. It will also allow you to save the template or open others.
- *Tick-box page:* A page which allows the user to tick the relevant boxes in an easy-to-use format and clear the tick-boxes when done. It may be more user-friendly and attractive to use boxes, labels or buttons that can be selected or deselected, which also reduces the number of on-screen elements.
- *Output page:* A popup or page where the output text is displayed, and the user can save, share or export the text quickly to add elsewhere.

Further features

- *Save and open:* Being able to save different templates would be a landmark feature in the development process. It would be highly desirable for a user as long as they can easily export results in the meantime. Being able to save to device or server would mean it would be a much more attractive product because users could have templates and organisations such as hospitals or centres could store the data and provide standardised templates
- *Cloud sync:* The user could easily swap between devices. For example, making the selections on an iPad and then changing to the desktop app to export the results. Alternatively, a user might want to use different devices at different workplaces.
- *Adaptive layout:* In the event the user chooses to create whole sentences to select, the *Setup page* will need to allow these sentences to stack clearly on top of each other and the *Tick-box page* will need to allow at least a few of the words of each sentence to be visible, possibly the whole sentence. The team will need to put effort into an adaptive layout to account for the variety of possible setups and also different device sizes.
- *Sentence logic:* Saving files may allow users to create different templates for different situations. However, the app may also need to display certain sentences based on the selections made in earlier sentences by creating an additional input area on the *Setup page.* It would be a simple input where the user writes the keyword(s) that the sentence is contingent upon. It would remain hidden until those words are used in the *Tick-box* page.
- *Hotkeys and Background Operation:* Making the program work in the background (or with a floating window) that intercepts user-defined hotkeys before pasting the text into the current text field of the user's active

window. This would allow the user to make use of templates in other programs without having to switch between our application and the target programs. This function would be very beneficial in highly repetitive tasks.

Other design notes

It may be possible to make it a single page application and use modals for the Setup page and the Output page.

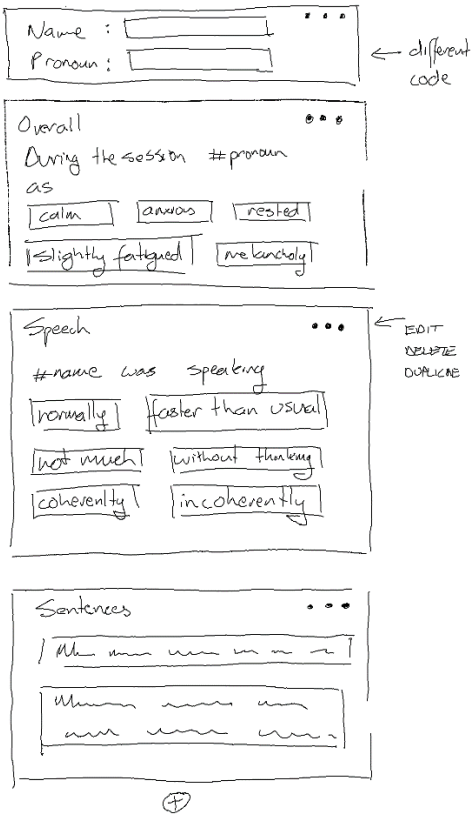


Figure 23: *First wireframe sketch by Satre 2021*

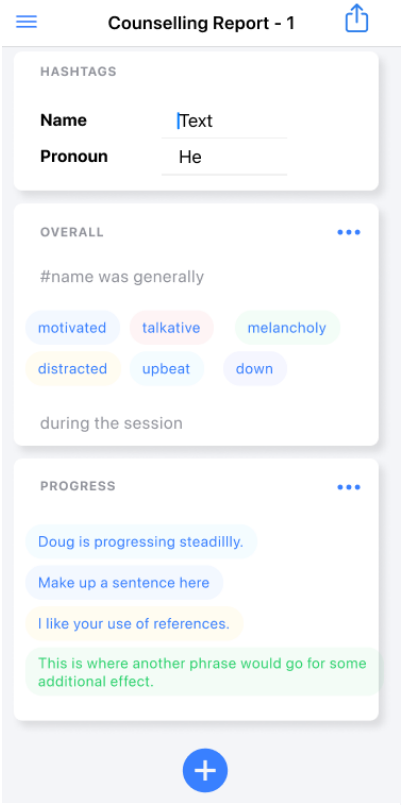


Figure 24: *Screen 1 by Satre 2021*

Tool Selection

Tool selection is a significant decision that can affect the project far into the future. The team cannot easily predict the difficulty in coding design and features in advance without a broad knowledge of the tools available.

Considerations include

- skills of the available team
- learning curves
- the size of the community and learning resources available
- maintainability
- security (this is less a concern at the early stages)
- testing and auditing

Figure *25: Tech Stack by Birukova & Suschevich, 2020*

Web App

Using a standard client-side web stack of HTML/CSS/JavaScript is the most obvious option (Oragui 2018). The team could expand this to using NodeJS and MongoDB server-side, using JavaScript (Suschevich 2020). It would require the least amount of new language or syntax learning to be done by the team. However, it would likely be time-consuming for some members to learn how to manage state, transitions between pages and

make elements look appealing and adaptive. It would also be possible to adapt this web code to install on mobile devices (using wrappers such as Capacitor and Cordova) making it a Hybrid App ("What is Capacitor?" 2018). However, users must find the app intuitive and easy to navigate based on their experience with other apps. Using a framework (such as React or Ionic) or at least a library such as Bootstrap, would reliably provide this familiar appearance and behaviour (Ovchinnikova 2020).

Ionic

One stand-out tool for rapid development would be the cross-platform programming system Ionic (Ionic 2020), which leverages HTML and Javascript web technologies, making it adaptable and quicker to learn. The code used in an ionic page is easily recognisable to a Web Developer.
The team can then use this single codebase to build the app for iOS, Android, web, desktop or any other platform where the web runs *("Ionic Article: Comparing Cross-Platform Frameworks" 2019).* Although it is not native code and runs as a web view in iOS, an Ionic application can also use native level protocols such as identity management or the camera.

Ionic comes in two parts. One is a set of UI components that can be used, including the JavaScript libraries on the page that you are writing in ionic-style code. The second part is the CLI which is more of a platform. It sets up the project folder/file hierarchy and can run as a server to serve the web app. Ionic also uses Capacitor to compile the hybrid app to be installed on non-web platforms. ("What is Capacitor?" 2018)

Ionic Libraries

Developers can use Ionic with several different front-end component libraries and frameworks. These are all built on JavaScript, HTML and CSS, so share some commonality. (Ionic 2020)

- Vue
- React
- StencilJS (or plain JavaScript)
- Angular

Of these options JS (JavaScript) is the most ubiquitous and would require the least new language learning on the part of those in the team coding the app. On the other hand, there is significantly more free learning material to be found online for React and Angular when used within an ionic project. Angular is popular but has regular breaking changes to the framework as it is upgraded and there have already been successive versions 1,2 and 3 (Rodriguez & Bell 2017). React is also a strong option and can be slowly migrated to from JavaScript.
It is possible to:

1. start coding in Ionic with a basic web app (does not require compiling, uses CDN (Content Delivery Network) for elements)
2. add react components if needed or as learnt
3. use an IDE (Integrated Development Environment) and Ionic-CLI (Command Line Interface) to compile an app for iOS and android
4. incorporate testing and CI (continuous integration)

React

> React is an open-source, front end, JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. *("React – A JavaScript library for building user interfaces" 2021).*

The main strength of React is that you can make attractive web applications without spending time thinking about and writing the HTML and CSS code required for formatting and appearance. It also can handle the functionality of the website. The main drawback is the learning time required beyond the basic web stack as it has a unique syntax.

React Native

> *React Native utilises the JS framework React, but renders native UI elements at runtime, allowing you to build iOS and Android apps.* ("Ionic Article: Comparing Cross-Platform Frameworks" 2019)

React Native is a prevalent tool for creating cross-platform apps. However, it can require slightly different code bases for each platform ("React Native Vs Ionic: Detailed Comparison 2020" 2021). One advantage is that developers can translate it from React easily, so the team could start developing a react web app and then progress to a react native app for mobile devices. It is not clear how much rewriting would be necessary, although it should be minimal as the bulk of this app idea involves the user interface; the app will require only a few platform-specific APIs and protocols.

iOS Native (XCode/Swift)

It might be possible for the team to learn Xcode programming and release it only on Mac ("Apple Developer: Mac Catalyst" 2021), iPad and iOS. However, from personal experience, Apple's XCode (IDE) and Swift (language) can present steep learning curves for new developers. The language is unique, strictly typed and has evolved significantly in recent years (meaning online examples are sometimes unreliable). XCode can be painful to navigate. Debugging, deployment and testing errors can be challenging without experience. Furthermore, this approach requires developers to install XCode and device simulators, often meaning they need a Mac computer.
However, the advantage is that the team could focus on one ecosystem and produce succinct code for a fast and seamless app experience.

Decision

The team prefers to build a prototype with a minimum amount of tooling lock-in. Writing a web page in pure JavaScript (with Ionic for UI enhancements) gives a wide amount of options to progress the application. It will still be efficient and fast to code an MVP given the existing web stack skills of the team. Once past the prototype stage, we can switch to a dedicated framework. After the basic functionality is implemented, refactoring part of the code using a different paradigm should be possible in a reasonable amount of time.

Version Control

Git would be used for version control and the repository hosted on GitHub. This is standard among modern app developers and there are a number of strong free alternatives if there are any issues encountered (van Gumster 2018; Atlassian 2019). Our team is also encouraged to use a GUI for git version control awareness. GitKraken is an excellent multi-platform option ("Free Git GUI Client - Windows, Mac & Linux | GitKraken" 2019).

Testing and integration

Cypress is a simple but effective testing tool for web platforms. It uses JavaScript code to set up which is already known by members of the team. It can be used as part of Continuous Integration if that is needed in later development ("JavaScript End to End Testing Framework" 2021).

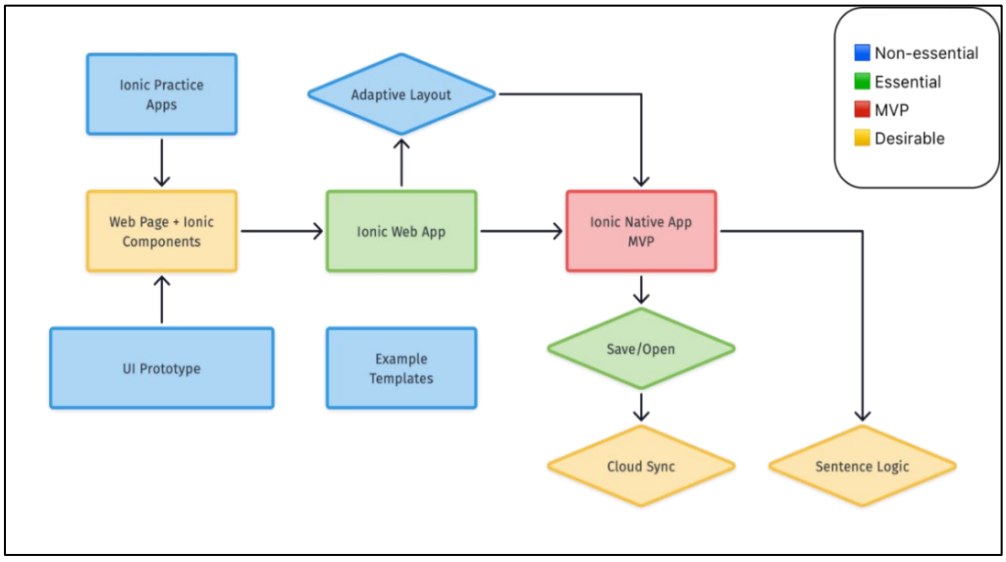


Figure 26: *Feature Map by Satre 2021*

Prototyping

InVision Studio is free for 1 project. (“Plans & Pricing” 2021). It has a good reputation among User Interface designers and should work. Figma (“A Free, Online Wireframing Tool to Help You Communicate Your Design” 2021) also offers a simple wireframing tool for free that could precede and possibly cover prototyping. Either software suite could be used with no significant disadvantages. Rough sketches will be the first stage of prototyping and, because the project is simple, may even be sufficient for MVP prototyping.

Skills and Feasibility

Programming skills for development and testing are the main requirement, but other skills will allow the app to take form more effectively. Prototyping and user outreach may prevent unnecessary code changes and provide an initial deliverable. Design and presentation skills could help create awareness of the product and advertise it well on a website and the various app stores. The biggest obstacle is likely going to be having to learn app development skills and potentially spending time on this rather than producing a product or alternative deliverable. However, this would be very easy to access, given the number of free or cheap online courses for Ionic development (Grimm 2020; Moroney 2020). Therefore, learning this is entirely possible in less than 10 hours. Also, there would be no need for external database usage in the Minimum Viable Product; the state and saved templates could be kept on the user's device.

Maintainability

The advantage of focussing on the standard we stack with Ionic components means that the languages used are unlikely to change quickly. This means there is less likelihood of coders needing to review the codebase and update it according to language changes or framework updates. The code most likely to need updating is the react components if they are used.

Outcome (MVP)

A successful app would allow many professionals to save work hours at a small cost and help improve the world. Professionals will be able to record the standard information more quickly and instead focus on the primary purpose of the appointment. However, even as a prototype, customer engagement and specification would allow development to continue at a later stage if found to be viable.

Group Reflection

Individual Reflection

Jarrad Elvey

Something that I was very conscious of was my dislike of working in groups which would lead to me over-contributing. My assigned tasks were Leadership, the Tools section, and the Website; and I think I performed well at those tasks and didn't over-contribute to other tasks, allowing others to contribute their fair share.

One thing I was surprised at was how much I enjoyed working collaboratively on the one shared document that I had (the Introduction section).

One thing that could have been improved, both for the group and as part of my responsibilities as the leader, was to get everyone on the same page with regards to the tools and how we were using them (and get confirmations from every team member) right at the start of the assignment.

Not having worked much in larger groups one thing that I learned about group work was how much leadership and communication activities really take away from doing activities that will be in the final report.

Doing group work has reaffirmed my preference for not doing group work. Which isn't that our group didn't work well, it did, but the "benefits" gained (of exposure to other ideas and less individual work to do) didn't outweigh the extra overhead required.

David Egan

Having worked in groups for much of my working life I found this experience quite different in that being wholly online it presented challenges that I had not dealt with in the past. Not being able to meet in person and having only the ability to communicate primarily via chat and shared documents within MS Teams is an area that I feel I have grown better in managing as the assignment has progressed.

I certainly feel that the group communicated clearly and concisely. All team members were willing to listen to each other's opinions and took any feedback on board when producing text for the assignment. Any larger decisions, such as choosing a team leader, were voted on and Jarrad (our group leader) communicated well and kept the team on path ensuring that all tasks were completed in a timely manner.

This experience for me has reminded me of how much I enjoy working with and collaborating with others. For example, through Jarrad I learnt better ways of structuring sentences and different grammatical uses. The team showed me that online learning and working without physically being near each other is not only possible, but can be just as enjoyable, provided everyone is aware of expectations from the beginning and manages their time appropriately.

Ayub Khayre

Being a part of many teams, I found this to be a unique experience. I feel as though our group did work well even though we were all working remotely. We were quick to setup documents and assign tasks to individuals to complete. Our team members were punctual for meetings which added to a better collaborative effort. In some instances, there were some disagreements our group carefully listened to all opinions and voted on a solution.

Although this isn't a major issue one thing that can be improved is the use of multiple documents, at the beginning I did find it difficult locating all documents, this was resolved quickly by creating an assignment two folder.

One thing that did surprise me was the vast amount of knowledge in our group. I was surprised to see that we had team members that worked in different industries, for example Alexis has worked in the Aeronautical field as a Pilot and Jonathan is currently working in the medical field.

From the assignment I learnt that everyone has their own learning style and processes, I also learnt that this is crucial in determining how a group may or may not operate. This experience has made me more intrigued about the psychology of human learning and group dynamics.

Alexis Satre

I found the group work quite energising and beneficial because you are getting constant feedback rather than one set of feedback after an assessment is marked. As we all could meet often this interaction was great for my morale in the context of an online course that can be a bit isolating. After meetings we could discuss random topics or things that had come up in our other coursework, much like might occur at an in-person workplace or university. Often there wasn't much scope to have these kinds of interactions elsewhere in the course.

What I found worked well in our group was that we took the time early in the project to develop a framework for how we were going to spend the next weeks working together on the assignment. We used documents to discuss the different merits of leadership models and group structure and used spreadsheets to make group decisions on things like names and meeting times. Our leader did a great job in setting up the digital workspace by arranging meetings, setting up minutes and action document templates. We also kept the pace of decisions and taskings manageable for all group members so that we could all go through the learning process together and reach consensus before moving on. All team members were well aware of what was being done by who and could assist each other easily by using the collaboration tools in the Microsoft software suite.

We could probably improve our collaboration during the content writing and work. Sometimes there were delays in giving each other feedback and discussing topics. So in the next project we may decide to have 'group work times' where we work independently but online together. This might also help productivity.

I learned that group work can often be slow and the administration of it tedious but developing a good teamwork system means the work can be effective and team can scale up easily to work on large tasks.

Jonathan Seah

Making a formal group for projects is a first for me at a level past secondary school. While I had reservations about how well a group could work for formal projects outside of work, the course project went surprisingly well.

All members performed on their portions of work with a coordination that still surprises me. We collaborated on documents, pieced together different portions of work and had seamless meetings with little drama.

The usage of Teams and its interfacing with different technologies could have been improved. Some members had issues with overwriting changes, which might have been solved with a proper version control system, though such might be overkill for text projects.

Other interfacing difficulties involved duplication of work or desyncing documents when replicated across multiple folders. A better archival process is needed to keep the current "live" document in a single place.

Overall, the group work was productive despite the overhead costs of coordination.

Group Reflection

At the start of the assignment, as soon as the group was formed, we created documents to gather input from our group members on how we could best collaborate on the group work (Group-work Design Document.docx), what the meeting format should be (Meeting Format.docx), and the initial splitting of the tasks into assignable sections (Tasks Masterlist.docx - which has since evolved into the main document that tracked our contributions). This worked well as it helped to focus the group and get an initial indication for how we would work together.

An area that our group could improve upon for future assignments is ensuring that all team members are working to the same expectation with agreed tools. As an example, our group determined that the use of an online tool, mybib, for the management of references, as well as taking advantage of file sharing within MS Teams would be beneficial. In using these tools however, we did not set any rules for their use which saw team members either not accessing specific shared files early on causing some confusion, and references in mybib not initially shared or mixed with other section's references. By setting expectations on how we will use tools it will help make the team more productive and efficient.

While standardization of tools across the group and some rules to prevent duplication of documents causing confusion might solve our coordination problems, the overhead costs of such rules and necessary work to prepare each person's working environment may outweigh the difficulties caused. In this project, we had one or two documents needing merging for conflicting changes and one person's contribution being overwritten; this only required a small amount of error correction and resolving the confusion in the team meetings. Costs to mitigate these issues should be weighed against the benefits of doing so. A larger team size and longer or greater project scope might justify formal measures against such coordination issues

We learned how to collaborate as a group. By using the shared documents, we could all write in the same document at the same time/almost seamlessly because of the autosave feature and the fast data connection enabled by the Microsoft cloud applications. We could add comments on each other's work and use them to mark areas that still needed attention. In our final report document, the person responsible for the composition could use the track-changes feature and comments to keep an eye on changes that any other team members made. We also found the overhead of coordination to be higher than we expected. Regularly communicating our ideas and progress was onerous, especially in contrast to individual work where all one needs to do is organise their own thoughts and planning. This overhead was made easier by the team keeping communication succinct (although meetings were often relaxed and often went slightly overtime) and writing clear notes in the meeting agenda/minutes. The team members also made things easier by being responsive to group messages and being involved in the general working discussions on the main group chat.

While there were more and less proactive members in our group everyone was involved enough that it is fair to say that we all contributed equally to the assignment.

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Appendix

Audio 1: IT Work Interview Recording

[Microsoft Teams link]

Table 7: *IT job titles (Burning Glass Technologies 2020, data)*

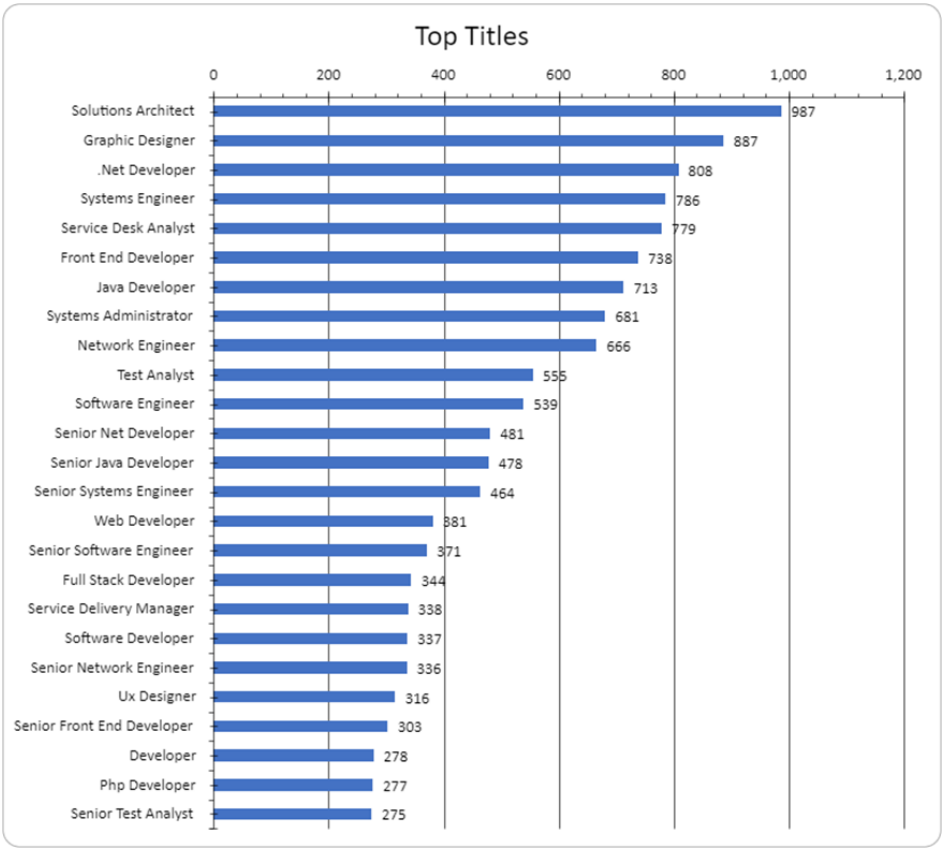

Table 8: *Top occupations (Burning Glass Technologies 2020, data)*

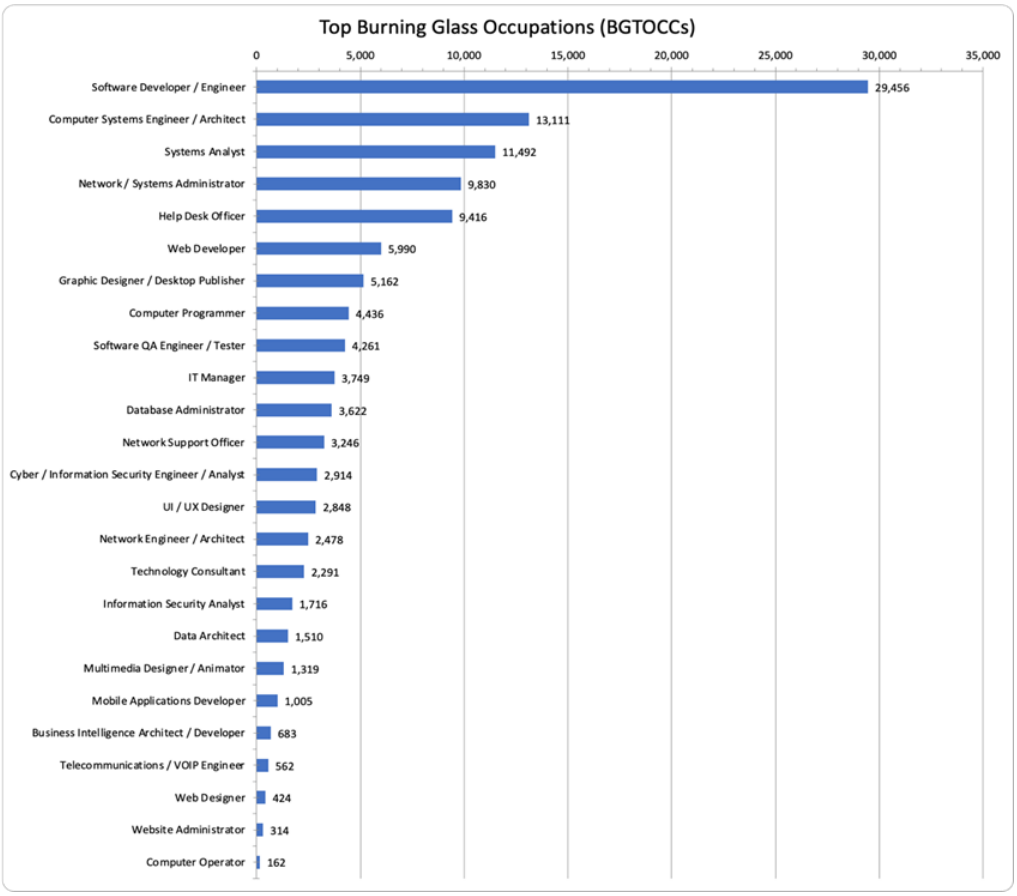

Table 9: *Generic skills in demand (Burning Glass Technologies 2020, data)*

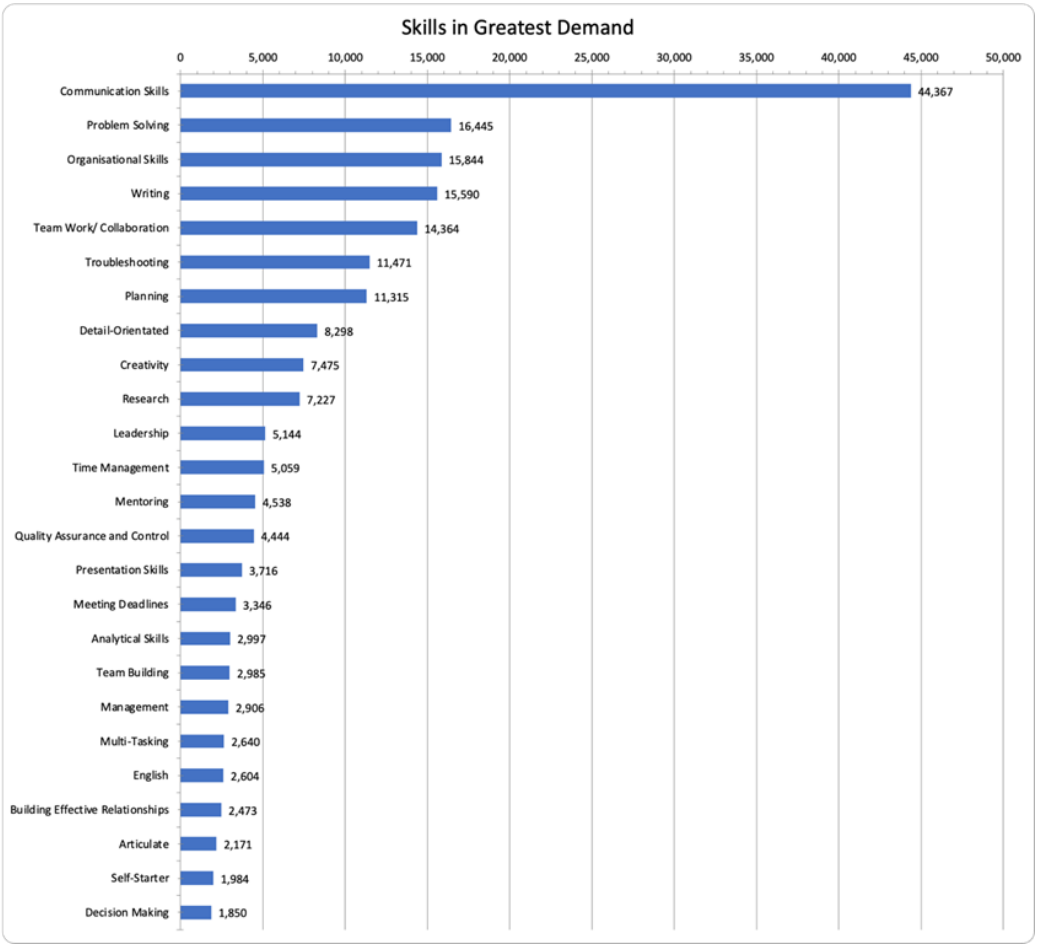
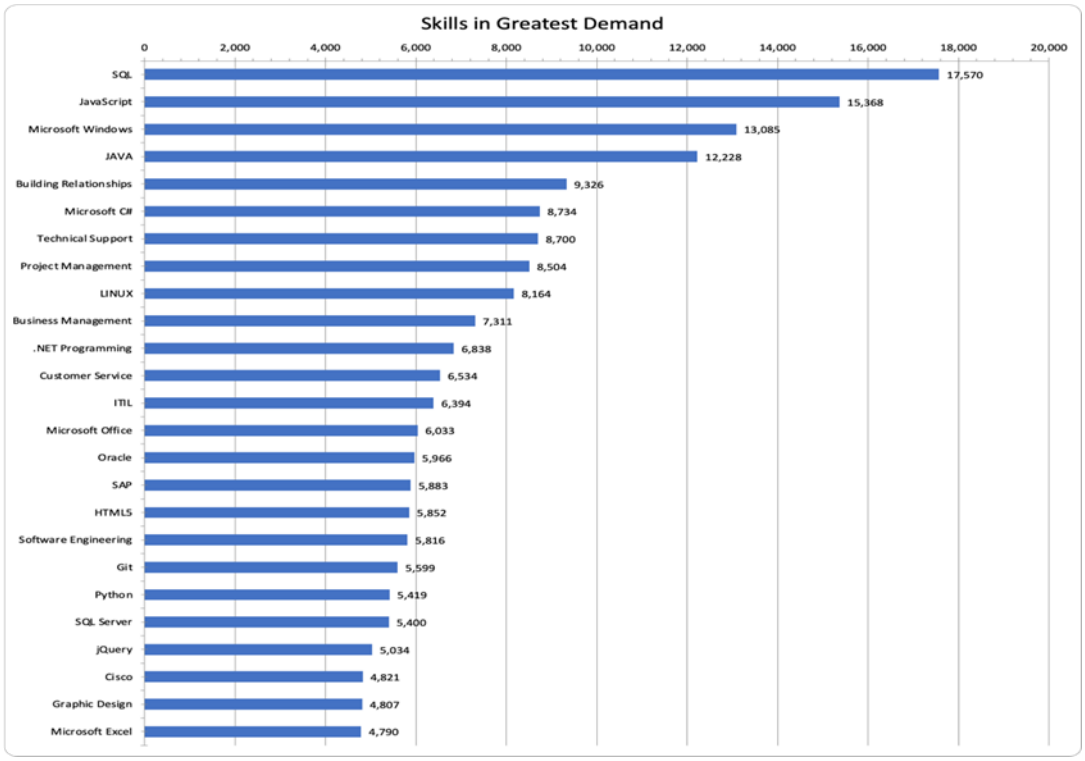
Table 10: *IT skills in demand (Burning Glass Technologies 2020, data)*