

Assessment 2

THE BOX OUTSIDE THE BOX OF INVENTORY MANAGEMENT

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TABLE OF CONTENTS

TEAM PROFILE	3
<i>Our Team Name.....</i>	<i>3</i>
<i>Personal Information</i>	<i>3</i>
<i>Team Profile.....</i>	<i>6</i>
IDEAL JOBS.....	8
<i>Overview</i>	<i>8</i>
<i>Similarities</i>	<i>8</i>
<i>Differences.....</i>	<i>9</i>
<i>Conclusion.....</i>	<i>9</i>
TOOLS.....	11
<i>GitHub.....</i>	<i>11</i>
<i>Microsoft Teams</i>	<i>12</i>
Microsoft Teams Invite Link.....	12
Microsoft Teams Collaboration	12
<i>Other Tools Used</i>	<i>12</i>
Excel Spreadsheets	12
INDUSTRY DATA	13
<i>Industry Snapshot</i>	<i>13</i>
<i>What Does This Mean For Our Team?.....</i>	<i>14</i>
<i>Observations On Data Findings</i>	<i>15</i>
<i>Has Our Opinion Of Our Ideal Jobs Changed?</i>	<i>19</i>
IT WORK	21
IT TECHNOLOGIES	21
<i>Machine Learning</i>	<i>21</i>
Introduction.....	21
Machine Learning	22
How Does A Machine Learn?	23
Machine Learning In Our Daily Lives.....	25
Our Relationship With Machine Learning.....	26
<i>Natural Language Processing And Chatterbots.....</i>	<i>28</i>
Introduction.....	28
Natural Language Processing (NLP)	28
Chatterbots.....	30
The Now.....	31
The Future	32

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Assessment 2 -My profile – Group # 12

Summary.....	33
Example Chatbot Interactions	34
<i>Autonomous Vehicles</i>	<i>35</i>
Introduction.....	35
Autonomous VS Automated	35
Automotive Autonomy	36
Other Uses For Autonomous Capabilities.....	37
The Autonomous Future.....	38
Our Autonomous Lives	39
<i>Blockchain-based Public Key Infrastructure.....</i>	<i>40</i>
Introduction.....	40
Public Key Infrastructure	41
Blockchain.....	43
Our Thoughts.....	46
PROJECT IDEAS	47
Overview.....	47
What is Inventory Management.....	48
stockIT.....	50
Deliverables For Assignment 3	65
GROUP REFLECTION.....	66
<i>The Group's Reflection.....</i>	<i>66</i>
<i>Members' Reflection.....</i>	<i>70</i>
LIST OF FIGURES.....	75
REFERENCES.....	77
APPENDIX	81
<i>Appendix A.....</i>	<i>81</i>
<i>Appendix B.....</i>	<i>82</i>
<i>Appendix C.....</i>	<i>83</i>

TEAM PROFILE

OUR TEAM NAME



Figure 1 – Source: Adobe Spark, 2021

PERSONAL INFORMATION

Ahmet Akgun

Student No: S3865010

Originally from Istanbul Turkey, Ahmet's passion for IT started in 1992, when his uncle assembled their first personal computer. Their first computer had MSDOS 4.0 installed and provided the young Ahmet with various experiences such as customising a data storage device and entering lines of code in the command bar. It was this first interaction with a computer that fostered his interest in IT.



After graduating from RMIT university, he intends to continue his study at the post-graduate level in hopes to become an instructor at an education institution one day. Ahmet's hobbies include learning about astronomy and astrophysics, playing chess and editing music using a program called CoolEdit. He currently lives in Melbourne Australia.

Brandon McPherson

Student No: S3921902

Brandon is a person with a wide range of interests. In his spare time, he enjoys playing video games, watching soccer games, spending time with friends and family, and travelling. He is also an enthusiastic reader, his favourite book for this year is titled *Sapiens: A Brief History of Humankind* by *Yuval Noah Harari*. In his childhood, he used to play a game called *Sonic the hedgehog*. The experience resulted in developing his passion for video games and technology.



At the time of this writing, he has already been working in the IT industry as an information system support analyst for 7 years. Despite his solid background in networking and information systems, he found computer programming interesting and is considering a career change as a full stack software developer in the future. He lives in Brisbane with his cat named Indy.

Hugo Hughes

Student No: S3923309

Hugo has a culturally diversified family background with his parents and grandparents who originated from various countries all over the world. He is a keen learner of different languages and loves to travel the world to experience different cultures. In his childhood, information technology was not something he was familiar with nor interested in. However, it all changed when he landed a job at an IT service desk.



With this challenging role, he gradually developed his passion in IT. The role also allowed him an opportunity to brush up on the basic skills that are required to secure his ideal job in the future. His ideal role is to work for the Royal Australian Navy as a Cyber Security Technician. The position interests him because it requires him to be multifaceted and be familiar with various disciplines.

Taylen Robert Anderson

Student No: S3925287

Born in Idaho USA, Taylen grew up in Mornington Peninsula, the southeast of Melbourne. Taylen started nurturing his interest in IT when his father was building websites, it was here that he began playing around with Macromedia flash. Due to Taylen's proficiency with building websites, his IT teacher offered him to build a website for the teacher's dad, the website was built using ActionScript 2.0 which is now deprecated. Since then, he taught himself various computer skills and successfully implemented a server which is running his smart home system for his family.



Being a qualified mechanic, he has a strong understanding of electronics. Also, as an astute self-learner, He acquired a basic understanding in programming languages

such as C and C++. In the future, he sees himself becoming a firmware engineer which allows him to be involved with both hardware and software development. He currently lives in West Gippsland with his wife and child.

Tetsu Watanabe

Student No: S3923443

Born and raised in Japan, Tetsu came to Australia over 20 years ago. He worked at several accounting practices in Brisbane before starting his consulting firm targeting Japanese businesses. The company has grown after 8 years of operation, expanding his client offices in Brisbane, Japan, and Vietnam.



He has witnessed the substantial evolution of IT in the accounting industry. He believes that combining IT and Accounting skills will take him and his company to the next level. His hobby is surfing, which is the reason he moved to Tweed Heads 3 years ago with his family.

Tim Prast

Student No: S3923309

Tim has a successful business background operating his own bar in Subiaco for the past 5 years. His business is technically advanced and uses the latest technologies to achieve efficient operation. His interest in IT came naturally by having a childhood surrounded by technology and can easily relate himself to IT. Throughout his life, he has enjoyed experiencing the technological advancement.



Gaming has also significantly contributed to developing his interest in the field of IT, his passion for gaming led him to build his own gaming PC. With his strong commercial experience, he hopes to transition his studies over to Computer Science and pursue a career as a business analyst specialising in IT.

TEAM PROFILE

The test outcomes for our members are tabled and summarised below (Table A).

The followings are snapshots of who we are as a team.

- We are more introverted than extraverted.
- We are more intuitive than observant.
- We are more logical than emotional thinkers.
- We are equally decisive and flexible.
- We are more self-assured and even-tempered than self-conscious and sensitive.
- We tend to learn by doing & seeing rather than listening.

Information obtained from test results is helpful to facilitate the group's collaboration. For example, our test results demonstrate our introverted nature. It took two online meetings before we determine our roles and the leadership to make visible progress with the assessment. This may be an example of the introverted nature of the team working against us. If we shared this information before the meeting, we may have acted differently.

A good aspect of our team might be that we think logically, this means that we know the consequences if we do not collaborate and execute our plan properly. Therefore, after the first two meetings, we quickly realised that it was in our best interest for the

“The strength of the team is each individual member. The strength of each member is the team.”

— Phil Jackson

Source: www.goodreads.com, n.d.

team to work together and complete the tasks.

The test results also helped us to decide how to deal with each member. Everyone has their own strength and weaknesses. Knowing

them would positively influence each other. We understand that acknowledging the individual differences is a good starting point to collaborate and proceed with our team project.

Team Member	Test 1 - Myers-Briggs Type Indicator (MBTI) test		test 2 - Online learning style test	test 3 - Further online test	
Ahmet Akgun	<u>Mediator</u> Introverted 58% Intuitive 70%	Feeling 52% Prospecting 51% Assertive 83%	ONLINE LEARNING STYLE TEST	CREATIVITY TEST	
			Visual 67% Kinaesthetic 59% Auditory 33%	69.99 (Typical score is 62.96)	
Brandon McPherson	<u>Architect</u> Introverted 84% Intuitive 73%	Thinking 52% Judging 69% Assertive 54%	LEADERSHIP STYLE TEST	BIG FIVE PERSONALITY TEST	
			Contrarian leaders – mostly independent and question normality.	Extroversion 13 Emotional stability 39 Agreeableness 21	Conscientiousness 67 Intellect/Imagination 65
Hugo Hughes	<u>Debater</u> Extraverted 85% Intuitive 93%	Thinking 59% Prospecting 67% Assertive 51%	MULTIPLE INTELLIGENCE TEST	EMOTIONAL INTELLIGENCE TEST	
			His top three intelligence and learning styles are kinaesthetic, Musical, and linguistic.	EQ scoring of 19 out of 20	
Taylen Anderson	<u>Virtuoso</u> Introverted 59% Observant 52%	Thinking 68% Prospecting 74% Turbulent 72%	ONLINE LEARNING STYLE TEST	BIG FIVE PERSONALITY TEST	
			Kinaesthetic 64 Visual 64 Auditory 41	Extroversion 70 Emotional stability 7 Agreeableness 17	Conscientiousness 2 Intellect/Imagination 34
Tetsu Watanabe	<u>Logistician</u> Introverted 73% Observant 51%	Thinking 59% Judging 67% Turbulent 56%	ONLINE LEARNING STYLE TEST	BIG FIVE PERSONALITY TEST	
			Visual 59 Auditory 46 Kinaesthetic 46	Extraversion 35% Openness 56% Agreeableness 54%	Conscientiousness 62.5% Neuroticism 42%
Tim Prast	<u>Assertive Advocate</u> Introverted 59% Intuitive 70%	Feeling 59% Judging 63% Assertive 54%	PERSONAL LEARNING PROFILE	SITUATIONAL JUDGEMENT TEST	
			His focus areas are Personal Value, Using Technology while his strengths are Accessing Support and Persistence	Answered 11 out of 16 questions correctly.	

The table A: Personality Test Results

IDEAL JOBS

OVERVIEW

We have found both similarities and differences for our ideal jobs. The summary of the findings is tabled and outlined below (Table B).

Three of our team members consider roles in the public sector for their ideal jobs. Of those who chose a private sector, two (Brandon and Tetsu) picked the full stack developer role whilst the remaining member (Taylen) is determined to become a firmware engineer.

We found that each job required both technical and soft skills. However, the emphasis on soft skills tends to be stronger for those in the public sector. We believe that there are two reasons for this. The first is because roles within the private sector are highly specialised, so the job advertisements aim to attract only those who have specific technical expertise. The second is because the public sector is likely to have a more hierarchical organisational structure and is vital for employees to understand and follow a chain of command which requires them to have good people skill.

SIMILARITIES

Among our ideal jobs, the most common technical requirement is programming skills. All three roles in the private sector require fluency in at least one or two programming languages. The knowledge in SQL databases and version control systems such as GIT is also highly regarded in the private sector.

Among the many soft skills, communication is by far the most preferable skill in the public sector. The ability to manage people is another important skill that is sought



Figure 2 – Photo of people doing handshakes
Source: Fauxels, 5AD

after in this sector. The skill includes the management of stakeholders, tasks, and projects.

Roles in the private sector tend to emphasise an ability to adapt and learn new technologies rather than people skills. This may indicate the employers' intention to hire a highly specialised technician.

DIFFERENCES

We found that each role has its unique aspect. For example, Taylen's role as a firmware engineer requires him to understand basic electronics and mechatronics which are not a requirement for the other roles mentioned. Brandon and Tetsu chose the same job title as full stack developer. However, there is a prominent difference in required skill sets. Brandon's role has a stronger emphasis on programming skills. On the other hand, Tetsu's role leans toward a thorough understanding of the web application development process rather than focus on programming.

Also, every job has an element of unique specialisation. For example, in the case of Ahmet, it is the teaching. For Hugo, it is the cyber security. For Tim, it is the data management/analysis.

CONCLUSION

We found that there are some skills and knowledge that commonly attract our potential employers. These are technical expertise in programming, SQL database, and version control system as well as soft skills such as communication and management skills.

We also found that there were differences in each job. These differences arise as the result of different specialisation that we choose to pursue.

It is concluded that although it is important to develop commonly preferred skills specified by employers, having a specific specialisation would significantly influence our future job prospects and career path.

Team Member	Job Title	occupation	Requirement		Similarity	Difference
			Technical	Soft		
Ahmet Akgun	Instructor of Information Technology	Education tutor	<ul style="list-style-type: none"> Online course development Learning Management Software 	<ul style="list-style-type: none"> Master's degree Communication Teaching 	<ul style="list-style-type: none"> Communication 	<ul style="list-style-type: none"> Emphasis on formal education and teaching skill
Brandon McPherson	Full Stack Developer	Software developer	<ul style="list-style-type: none"> Cloud technologies SQL Database Various programming Version control 	<ul style="list-style-type: none"> Ability to adopt new technologies Adaptability with different technologies 	<ul style="list-style-type: none"> SQL Database Programming Version control Ability to adopt new technologies 	<ul style="list-style-type: none"> Very specialised in programming
Hugo Hughes	Cyber Security Technical Officer	Cyber security specialist	<ul style="list-style-type: none"> Computer Science/Cyber Security qualification/experience 	<ul style="list-style-type: none"> Management Analytical Communication Stakeholder management 	<ul style="list-style-type: none"> Management Communication 	<ul style="list-style-type: none"> Emphasis on soft skills Focus on Cyber security
Taylen Anderson	Firmware Engineer	Computer engineer	<ul style="list-style-type: none"> C, C++, and a higher - level language Tertiary education Electronics Version control 	<ul style="list-style-type: none"> Ability to adopt new technologies Attention to detail 	<ul style="list-style-type: none"> Programming Version control Attention to details Ability to adopt new technologies 	<ul style="list-style-type: none"> Emphasis on engineering (Software, Mechatronic and Electronics) IoT
Tetsu Watanabe	Full-Stack Software Developer	Software developer	<ul style="list-style-type: none"> Cloud technologies SQL Database PHP Version control 	<ul style="list-style-type: none"> Ability to work solo and in a team 	<ul style="list-style-type: none"> Programming Version control SQL Database 	<ul style="list-style-type: none"> Involvement in the full web application development cycle
Tim Prast	Business Analyst	Analyst	<ul style="list-style-type: none"> Business analysis experience SQL Databases Understanding of various IT areas Data modelling & Data management 	<ul style="list-style-type: none"> Communication stakeholder management Ability to see the big picture Attention to details 	<ul style="list-style-type: none"> Management Communication Attention to detail SQL Database 	<ul style="list-style-type: none"> Balanced between technical and soft skills Emphasis on data management

The table B: Summary of ideal jobs

TOOLS

GITHUB

GitHub Pages URL

<https://taylenanderson.github.io/stockIT/index.html>

GitHub Public Repository URL

<https://github.com/taylenAnderson/stockIT>

Comments on the team's Git repository

The full audit trail on the team's commits can found at the following [link](#).

The audit trail shows that Taylen, our assigned manager for the development of the website, made the first commit. No other member pushed any commit until the 7th of October 2021. Prior to that, we used Microsoft Teams to share our documents. GitHub was first introduced to the team when one member made a [Youtube](#) video to facilitate other members to set up the group repository in their local drives. Initially, some members were hesitant to use GitHub due to a lack of experience and knowledge in its use. We had a stereotype of GitHub as mainly being used for a programming collaboration and did not think of it as a tool to share other files such as word documents or PDF's. We soon realised that it can be a powerful tool that can be used to make our file sharing and tracking as effortless as possible. Closer to the end of assignment completion, we had an occasion where there was a misunderstanding within the team as to which file version was ready for proofreading. This incident occurred due to an inconsistency in our document naming, file structure, and a miscommunication with project management. We took the incident as a valuable lesson that helped us understand how Git works and file naming conventions that should be used for the next group assignment. We believe that the audit trail and other information attainable from the repository demonstrate our collaborative effort and improvement in utilising the tool more frequently and effectively. We have included snapshots of some usage data obtainable from our repository (as of 15th of October 2021) in [Appendix A](#) for your information.

MICROSOFT TEAMS

MICROSOFT TEAMS INVITE LINK

<https://teams.microsoft.com/l/team/19%3a9Myjlii3NQaWmcpGtjxWffQmZgmL-1rA13fQ8CUmn6g1%40thread.tacv2/conversations?groupId=24f3f6bd-b9be-4a72-8a4f-c982e853354a&tenantId=d1323671-cdbe-4417-b4d4-bdb24b51316b>

Please note that we have used the chats section for most of the group's conversation and collaboration. If you require access to our chats history, please contact our team leader, Tetsu Watanabe, via email: s3923443@student.rmit.edu.au.

MICROSOFT TEAMS COLLABORATION

Please note that we have held the total of 7 official team meetings during the preparation of this report, not including an unofficial meeting being planned 17th of October 2021.

For Microsoft Teams meeting agenda & actions, please refer to the PDF report titled *Group # 12 - MS.PDF* that is submitted in conjunction with this report.

We have communicated daily using chats section of Microsoft Teams to supplement our official meetings held twice a week. These frequent communications within the group assisted each member to be accountable with their tasks and be informed with the progress of the assignment.

OTHER TOOLS USED

EXCEL SPREADSHEETS

We have used Microsoft Excel spreadsheets to manage tasks assigned to each member. The snapshot of Excel spreadsheets adopted by the team are attached in [Appendix B](#). These spreadsheets were vital tools for the group to share and monitor the project progress.

INDUSTRY DATA

INDUSTRY SNAPSHOT

Australia is rapidly becoming an increasingly digitalised society. Recent health and socio-economic upheavals, caused by the COVID-19 pandemic, has accelerated our nation's push to develop strong digital sovereignty and capability. This shift can be captured through industry statistics, where the Australian Computer Society (ACS) reports in the 'ACS' Demand & Impacts on Tech &



Figure 3– Close-up Photo of Survey Spreadsheet
Source: Lukas, 2017

Digital Skills White Paper 2021, 'that the ICT & Technology Workforce grew by 33,400 to 805,525 which represents an annual increase of 4.3 per cent, (contrary to) other professional industries which only saw growth of 1.3 per cent and the overall unemployment rate which increased by 1.7 per cent (Australian Computer Society, 2021, P7). Further to this, the *Skills Priority List* identifies numerous ICT-related professions that are in national shortages and predicts continued moderate to strong demand for these skillsets in the future (National Skills Commission, 2021, P6).

Industry statistics are consistent with Government initiatives and plans that look to establish Australia and the Australian Government as a leading digitally run society. Released in 2018 by the Digital Transformation Agency, the *Digital Transformation Strategy* recognises that 'Australia's ongoing success depends on our ability to harness these technological advances'(National Skills Commission, 2021, P6) and that 'the pace of change continues to blur the boundaries of the physical and digital worlds(National Skills Commission, 2021, P6).' Programs such as CSIRO's (Commonwealth Scientific and Industrial Research Organisation) Data 61, the Australian Defence Force Cyber Gap program and the Digital Cadetship program all seek to bridge digital skill and capability gaps in Australia's workforce.

WHAT DOES THIS MEAN FOR OUR TEAM?

The Department of Industry in their report *Australia's Tech Future* highlights the innate value of embracing digital technologies from a business perspective. “Small and Medium businesses with higher levels of digital engagement are significantly more likely to be growing revenue, creating jobs, exporting and innovating new products or services” (Department of Industry, 2018, P17). There is a strong need for educators, developers and analysts, enabling businesses and Government to grow and deliver services that are effective, efficient and accessible.

Below compares our team's ideal jobs against Industry Data developed by Burning Glass in 2018, the Australian Computer Society in 2021 and the National Skills Commission *Skills Priority List* released in 2021.

Name	Ideal Job	Rank against Burning Glass - Data	Rank against Australian Computer Society - Data	Demand in Skills Priority List
Ahmet	IT Educator	0	14	NNS-StFD
Brandon	Full Stack Developer	17	9	NS-StFD
Hugo	Security Analyst	0	7	NS-StFD
Taylen	Firmware Engineer	11	4	NS-StFD
Tetsu	Full Stack Developer	17	9	NS-StFD
Timothy	Business Analyst	0	1	NNS-MFD
BG 1	Solutions Architect	1	N/A	NS-StFD
BG 2	Graphic Designer	2	N/A	NNS-StFD
BG 3	Net Developer	3	N/A	NNS-StFD
ACS 1	Business Analyst	N/A	1	NNS-MFD
ACS 2	Developer Programmer	N/A	2	NS-StFD
ACS 3	Systems Administrator	N/A	3	NNS-StFD
SPL 1	Developer Programmer	N/A	N/A	NS-StFD
SPL 2	Software Engineer	N/A	N/A	NS-StFD
SPL 3	ICT Security Specialist	N/A	N/A	NS-StFD

NS-StFD	National Shortage - Strong Future Demand	NNS-StFD	No National Shortage - Strong Future Demand	NNS-MFD	No National Shortage - Moderate Future Demand
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Sources: Labour Insight Jobs (Burning Glass Technologies 2018), National Skills Priority List (National Skills Commission 2021) Demands & Impacts on Tech & Digital Skills White Paper (Australian Computer Society 2021)

OBSERVATIONS ON DATA FINDINGS

The Business Analyst role does not rank in the Burning Glass Data (2018) but is Ranked First in ASC Data (2021). Causal factors for exclusion in the Burning Glass data can include:

- Change in Industry Demands
- Development of Industry in recognising the need for Business Analysts
- Expansion of traditional IT Roles, to now include business enablers such as Business Analysts to facilitate outcomes

There has been significant growth in the IT Industry over the past couple of years and consequently roles have been created and redefined to meet the needs of Industry. There has been a noticeable trend of Small and Medium Businesses adopting digital practices to assist in developing their enterprises and delivering their services. Business Analysts can be utilised to offer bespoke solutions to businesses and can be used to bridge a knowledge gap between non-digital using business owners and the digital world.

Most roles identified by the team have strong business demand or future strong business demand according to the National Skills Priority List. Demand for these skills can be attributed to the following:

- Industry Growth
- Dependency on Digital Services (increased digitalisation outside of ICT realm)
 - Supply of workers outweighs current demand
- National Need

The IT Industry has been one of the fastest growing Industry. This has been accelerated by increased access to technology, global events such as COVID-19 and the growing integration of digital capabilities into traditionally non-digitalised space. The boom in the use of IT services has occurred at a rate far greater than the industry's ability to recruit and train employees to necessary standard. This has created a huge workforce capability gap, requiring Government and Industry to develop strong incentives to attract people to study and work in IT.

The Security Analyst & Cyber roles were absent from Burning Glass Data (2018) yet ranked Seventh in the ASC Data (2021) and has been acknowledged as a skillset that is currently in National Shortage with a Strong Future Demand. Causal Factors for exclusion in the Burning Glass Data can include:

- Cyber Security and awareness have been the peripheral, not the main focus on organisations and Industry until recently
 - The Australian Government announced 2020 Cyber Security Strategy, replacing the 2016, noting the security environment is degrading at a rate greater than anticipated in 2016, with a reliance and integration of digital services increasing at a rate unprecedented in 2016.
 - The Government's 2016 Cyber Security Strategy invested \$230 million into Cyber Security functions; the Government's 2020 Cyber Security Strategy invested an additional \$1.35 billion into Cyber Security functions. (Department of Home Affairs, 2020,P2)
 - The significant increase in investment is indicative of the massive shift in the attitude towards cyber security.
- The function of cyber security could have been an assumed responsibility in some of roles in the Burning Glass Data.
 - Development of hardware and software is heavily intertwined with elements of cyber security.
 - Elements of cyber security is inherent in maintenance of a system

Further to this, we have extracted some of the core skills in each role we have chosen to create an aggregated group skillset and compared that to the Burning Glass data. It was harder to find an alternative data source that was consistent with the metrics used in the Burning Glass data to provide greater depth in the analysis of which skills are relevant in the ICT roles. This is partly due to the evolution and refinement of language used to describe and used by Industry.

Assessment 2 -My profile – Group # 12

	Job	General Skills 1	General Skills 2	General Skills 3	IT Skills 1	IT Skills 2	IT Skills 3
Ahmet	IT Educator	Communication Skills	Presentation Skills	Research	Building Relationships	Business Process	Business Management
Brandon	Full Stack Developer	Problem Solving	Planning	Analytical Skills	Java	Python	SQL
Hugo	Security Analyst	Problem Solving	Analytical Skills	Troubleshooting	Java	Python	Technical Support
Taylen	Firmware Engineer	Detail-Orientated	Troubleshooting	Quality Assurance	C	C++	Java
Tetsu	Full Stack Developer	Problem Solving	Planning	Analytical Skills	Java	Python	SQL
Timothy	Business Analyst	Communication Skills	Planning	Management	Project Management	Business Analysis	Business Management
Burning Glass	N/A	Communication Skills	Problem Solving	Organisational Skills	SQL	Java Script	JAVA
Aggregated Skillset (GS)	Problem Solving	2	Planning	7	Analytical Skills	17	
Burning Glass	Communication Skills	1	Problem Solving	2	Organisational Skills	3	
	IT Skills 1	Rank Against BGD	IT Skills 2	Rank Against BGD	IT Skills 3	Rank Against BGD	
Aggregated Skillset (IT)	Java	2	Python	22	Business Management	7	
Burning Glass	SQL	1	Java Script	2	JAVA	3	

Source: Labour Insight Jobs (Burning Glass Technologies 2018)

Planning, communication skills and problem solving are the most sought-after skills according to the Burning Glass data. This comes as no surprise as these skills are quintessential to every IT professional regardless of their role. Without the ability to communicate what a problem is, what needs to be done, who needs to be engaged to resolve it and who it may affect, it is hard to be effective within the IT Industry. Further to this, an IT professional often deals with numerous systems and processes, which often are not designed to operate to work with other systems. Having the necessary skills to be able to recognise and methodically solve problems are crucial in an industry that many people are rely on to perform their respective job. IT professionals are often faced with a suite of complex and intricate problems. Without a proper plan they are likely to encounter issues effectively implementing solutions. This could incur great financial and reputational costs if projects and solutions are not delivered promptly, especially in areas where the industry is heavily reliant on continual and stable access to IT.

Below outlines the top skillsets that fell outside of our group's aggregated skillset:

<i>Top Skills Outside of Aggregated Skillset - According to Burning Glass</i>	Top Skill 1	Top Skill 2	Top Skill 3
General Skill	Communication	Organisational Skills	Writing
IT Skill	SQL	Java Script	Microsoft Windows

There are a few causal factors that can provide key insights as to why these skills fell outside of our aggregated skillset:

BREADTH OF THE PROFESSIONS SELECTED BY INDIVIDUALS

In our group of six, five different professions were chosen across the IT industry. The professions selected comprised of a range of required technical abilities and strengths. As result our aggregated skillset was quite balanced across the entirety of the industry, rather than being focused on one specific area.

COMMUNICATION, WHILST AN INCREDIBLY IMPORTANT SKILL AND RELEVANT IN THE INDUSTRY, IS NOT THE KEY REASON SOMEONE WOULD BE HIRING AN IT PROFESSIONAL IN MOST CIRCUMSTANCES

The key differentiator in IT professions stem from the required level of technical proficiency needed to be effective in a role. It is less so defined by the communicative ability of the IT professional. Generally speaking, if you required a communications specialist, you will not be hiring an IT professional, unless you require a telecommunications specialist to fix your VoIP (Voice over IP). Jokes aside, the key skills required by the IT industry tend to have a focus on hard skill sets such as programming ability.

Whilst there definitely is a need for strong communicators in the IT Industry, there is also an equally strong, if not stronger need for technical specialists. For example, communication is a needed skill in the full stack developer role as you work with both front & back-end systems, meaning that you would most likely be dealing with a range of stakeholders. However, if you do not possess the technical skills necessary to perform a function, no amount of communication skills can bridge that capability gap

ORGANISATION SKILLS & WRITING ARE INTERCHANGEABLE WITH OTHER SKILLS

Whilst organisational skills fell out of our skillset, planning did not. Similarly, writing fell out of skillset, but communication skills featured more in the data that informed our aggregated skillset. These skills are heavily interchangeable and conceptually linked. To be an effective communicator, you need a balance of written and oral skills; to be an effective planner, you required a degree of organisational skills. The absence of these skills is not a point of concern, but

it is useful to understand what might be of interest to employers that is not in our preliminary focus.

BREADTH OF TECHNICAL SKILLS IN THE INDUSTRY

Our aggregated skillset lists three out of range of key technical skills in the industry. Consequently, it was a given that some major IT skills were going to fall out of our aggregated skillset such as SQL and JavaScript. Once again this is not a point of concern, but it is useful to have an awareness of what might be of interest to employers.

HAS OUR OPINION OF OUR IDEAL JOBS CHANGED?

In short, no. If anything, the data has solidified everyone's decision on their dream job. There are three causal reasons for this.

1. THE IT INDUSTRY IS GROWING AT A MUCH FASTER RATE THAN THE IT WORKFORCE IS.

Throughout this report on industry data, it has become abundantly clear that there is a current shortage of skilled IT workers. As the industry grows, the demand for certain technical skillsets will only increase further. As Ahmet said when asked if his dream job had changed, "organisations are becoming more computerised and businesses are becoming more digitalised" therefore "more education and training must be conducted to meet these requirements." For Hugo, the fact that the security analyst type roles did not feature in the Burning Glass data, but featured heavily in more current statistics he said, "the environment has clearly evolved a lot over the past few years" what this mean is "as everything becomes more digital, cyber-attacks are going to become more common, as a result, security analysts will become more relevant."

2. WHILST STATISTICS CAN HELP US MAKE INFORMED DECISIONS, PASSION IS WHAT REALLY DRIVES US.

When Taylen was asked about whether his ideal job had changed he led with "I am very passionate about how hardware and software communicate and interface with each other." His primary motivation is his curiosity and interest in the field. For Tetsu there are similar motivations, "my goal is to launch my own web application, so I feel that it is important to have skills across all areas of

web application development.” Whilst both acknowledged that the industry data was heavily supportive of their dream jobs, with both being in high demand, they both mention it is their passions and goals that drive them to pursue their career paths.

3. *INDUSTRY GROWTH AND DEMAND MEANS THAT THERE IS LONG TERM CAREER FLEXIBILITY.*

Given the breadth of the industry and the rate that it is growing, there is a clear advantage in gaining a set of core technical skills that can be deployed in different job environments. When Tim was asked whether or not his dream job had changed, he said that “it requires a skill set that will allow me to grow and change with the IT industry as whole.” He is mindful of “the swift changes that can occur within the IT industry” and seeks a skillset that can evolve with industry development. Similarly, Brandon observed a trend in industry noting that “with cloud becoming more and more prominent” in some roles “the pay margin is decreasing.” This supported his career path which requires “proficiency in many different languages and integrating them,” offering him career security and flexibility.

As a group and as individuals, the skills we seek and the professions we strive for put us in good stead for future proofing our careers. The demand for skilled ICT workers is now high and this is forecasted only to increase as not only our nation, but as the world becomes increasingly digitalised. Roles that typically have extremely limited ICT presence are becoming increasingly rarer as tools, processes and interfaces are being developed and automated to increase efficiency, outreach and impact for businesses and individuals. Gaining core IT skills allows the team to work in a range of Industries outside IT enabling strong flexibility and adaptability when it comes to building our careers.

IT WORK

For our IT Work, we interviewed Mr. Martin Harrington who is a Systems administrator for MS Queensland and has 15 years of experience within the IT field. The interview was conducted via Microsoft Teams and goes for roughly 30 minutes. We discussed on what his role entails as a systems administrator and some of the daily tasks, challenges and rewards that come with the role. We asked what IT is like working with business professionals to gain some insight of what an IT team represented to a business. As University students, we thought to ask what his learnings at university in IT was like at the time and what were the current trends being taught which was rather interesting. What I really like about the interview was his prediction on technology in the future and this is where the interview began to feel natural and informal. As a team, we took a lot of useful information from the interview and were very thankful that we had a great interviewee.

The video is watchable via the following YouTube link [YouTube video](#) for the transcript, please refer to [Appendix C](#) of this report.

IT TECHNOLOGIES

MACHINE LEARNING

INTRODUCTION

Machine Learning is the way by which a machine can interpret, understand and make meaning from a large volume of data. It is often purported that they do this in a way that mimics human behaviour and methodology. "Machine learning is an umbrella term that refers to a broad range of algorithms that

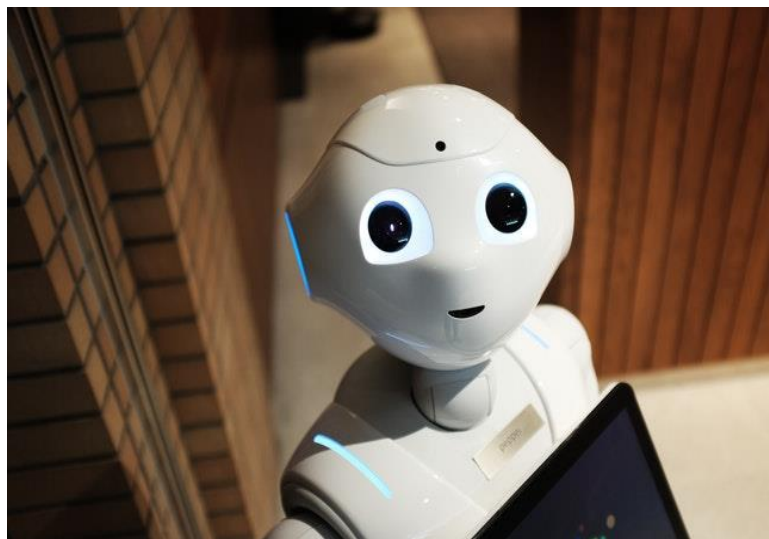


Figure 4– High-Angle Photo of Robot
Source: Knight, 2019

perform intelligent predictions based on a data set. These data sets are often large, perhaps consisting of millions of unique data points. Recent progress in machine learning has attained what appears to be a human level of semantic understanding and information extraction, and sometimes the ability to detect abstract patterns with greater accuracy than human experts” (J, et al., 2019). Machine learning and artificial intelligence are symbiotic, in the sense that one cannot exist without at least some aspect of the other. Therefore, to gain a true understanding of Machine Learning, it is important for us to understand what Artificial IntelAs defined by Prof Dalvinder Singh Grewal, PhD; “artificial intelligence is the mechanical simulation system of collecting knowledge and information and processing intelligence of universe: (collating and interpreting) and disseminating it to the eligible in the form of actionable intelligence.” (IOSR-JCE, 2021) It is the way by which a machine collects, collates, and acts on information it receives from artificial sensors. What makes it different from natural intelligence is that the processing is done entirely through artificial means and sensors. Artificial intelligence allows information to be collected by a machine’s software and hardware, usually a type of sensor, to be used by the machine to learn. This differs from machine learning, where its intent is to maximise the self-cognition of a machine with little to no human intervention. Unlike other types of artificial intelligence, machine learning does not require intensive programming and it allows a machine to learn by itself. This allows a machine to learn by itself.

MACHINE LEARNING

The concept of machine learning falls into three differing categories, (IBM, 2021) supervised, unsupervised and semi-supervised. In supervised learning, a machine is given a dataset and instructed to interpret it using a defined logical sequence. In unsupervised learning, the dataset is interpreted by the machine using a sequence of its own creation. It does not rely on human intervention to discover hidden patterns or data groupings. Semi-supervised learning uses a combination of both. It provides the machine with a smaller dataset and a defined logical sequence, which allows the machine to learn and adapt to create its own rationale to apply to future datasets. This can be useful when a machine creator only has access to limited number of datasets; by exposing the machine to many smaller sets it can be taught more with less overall exposure. An automated system capable of self-learning can predict the result of a situation, an event or task based on the relevant information available. Using this logic, a machine can in essence

pre-empt future outcomes, based on historical datasets.

The understanding and development of machine learning has diversified greatly over the past couple of years. Recent discoveries have branched into new areas of study such as: automated machine learning, neural Networks and transfer learning, showcasing some of the most advanced machine learning technologies and applications.

Automated machine learning simplifies data selection, processing, and extraction. This method reduces the time and resources needed to achieve desired results. More notably, it enables people who do not possess the knowledge or skills in machine learning to apply this technology to their field of work.

Neural networks are designed to emulate structures similar to that of the brains of animals and humans. Organic brains have neurons (nerve cells) to process information that is received from the five major senses (sight, sound, taste etc.); whereas artificial neural networks are composed of nodes that compute information from non-biological sensors. Machine learning is based on a machine's ability to learn from the data provided to it, but neural networks learn by classifying data after first processing it through their nodes, similar to the way in which a human brain operates.

Transfer learning is a method of machine learning that enables the data from a particular task to be carried to another related task. This method provides the opportunity for a machine to gain more knowledge and experience, thus making it more effective in future tasks. The machine will essentially learn from the repeated iterations of a given task.

HOW DOES A MACHINE LEARN?

Data and algorithms are the two main components of machine learning technology. The sophistication of an algorithm will determine the path a machine will follow whilst training itself. The quality of the data the machine has access to will drastically affect the content created by a self-learning system. Consequently, implementing more mathematical and geometrical applications like statistics, probability and charting will increase the intelligence of learning machines. Developments in the discipline of data science will allow machines to be fed information that is of a higher quality and greater quantity. Therefore, training and employing more data analysts will help develop machines that are capable of sorting information faster and with a greater degree of

accuracy.

A machine can be programmed to learn based on the data it is fed. If you need a machine to learn to recognise a street scene and to navigate using modern roadways, then it must be fed the required information. In this instance, the field of study of Computer Vision is applied. Computer vision can be broken down into three separate categories: semantic segmentation, image classification and object detection.

Semantic segmentation can be understood as giving a machine the information to “understand the structures and components of an image on a pixel level. Methods for semantic segmentation try to make predictions about the structures and objects in image.” (Marius, 2021)

An example of which can be seen below.

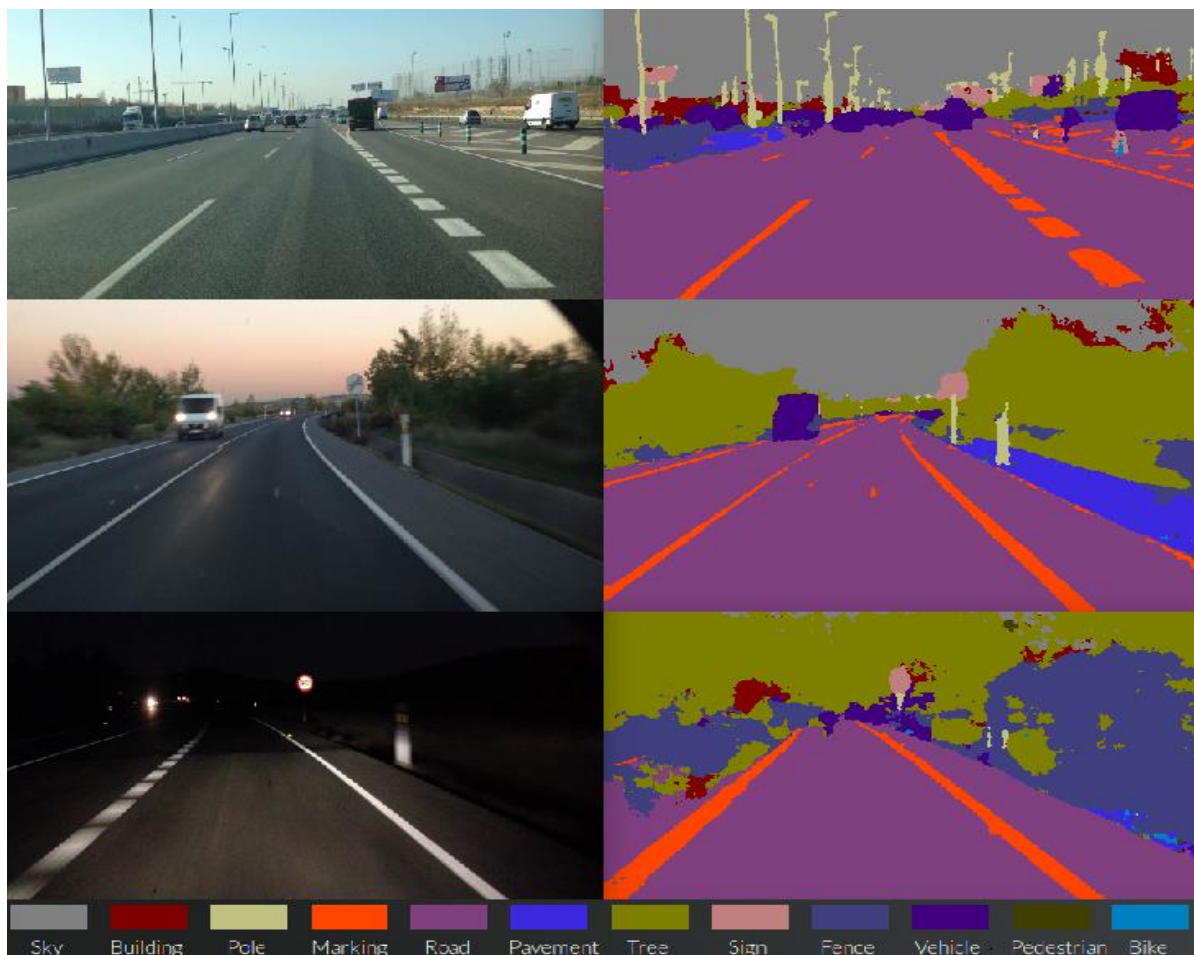


Figure 5 - Example cases of pixel wise segmentation performed by SegNet on real road scenarios, 2016 (Arroyo, 2016)

Unlike the example of semantic segmentation shown above, image classification focuses on the image holistically, rather than on its individual parts. It classifies the subject using the key component of an image. Tied directly to image classification is object

detection. Object detection technology works to identify the “instances of objects of a certain class within an image.” (Marius, 2021). In this sense, image classification might be used to feed data of a certain data type to an object detection machine learning algorithm to help it develop.

See also this document’s section on [Autonomous Vehicles](#) for more information relating to the machine learning behind a vehicles’ autonomous future.

[Natural language processing \(NLP\)](#) is a field of machine learning that we explore in another section of this document, but is worth mentioning while we are exploring the idea of machine learning as a whole.

While natural language processing is a large field of study, “all of them (the different fields of study within NLP) try to deduct some meaning from our language and perform calculations based on our language and its components. Algorithms based on NLP can be found in various applications and industries. Just to name a few applications which you might encounter every day such as translators, social media monitoring, chatbots, spam filters, grammar check in Microsoft word or messengers and virtual assistants.” (Marius, 2021)

Deep learning is a sub-type of machine learning technology and over the recent years it has received substantial interest from industry leaders and innovators. It mainly benefits from image and audio processing, artificial neural networks and both supervised and unsupervised learning styles. Traditional learning machines would require an expert to set their definitions, whereas machines with deep structured learning can differentiate objects from another by analysing their appearance and voice. Consequently, they tend to follow similar learning patterns to humans' when processing raw data.

MACHINE LEARNING IN OUR DAILY LIVES

Although at an early stage, deep learning technology is already used in digital vocabularies, translators, self-driving vehicles and video streaming platforms. Finance, electronic commerce, logistics and healthcare industries are widely benefitting from deep learning systems. When browsing shopping websites and viewing products, similar items displayed by the web browser use deep learning technology to find this information. Another example of this are the anti-fraud security systems of financial

organisations that detect suspicious activities by analysing live transactions and comparing them with information with past transactions.

Machine learning will enhance an organisation's data processing capabilities, thus increasing the productivity and profitability of a businesses. Marketing departments will have access to more specific information on the targeted demographics that would be interested in their products, providing them will more relevant statistics on markets and market behaviour. Production departments will have greater amounts of technical data available to them concerning the materials and techniques used to manufacture goods. Automated assembly lines will be assisted not only by human operators but learning machines that will enable power usage, material distribution and workflow optimisation. Logistics companies will have navigation systems augmented with learning machines, creating delivery routes with live traffic information, reducing delivery times and fuel consumption of their shipments. These examples showcase the value of machine learning in enabling us to efficiently and effectively utilise large datasets to achieve outcomes in a range of different industries.

The number of employment opportunities for people who are expects in the field of machine learning are sure to increase, as the technologies driving innovation develop and as it is use more by society.

On the other side, the need for people who provide these services manually will likely decrease as automated systems reach maturity. Organisations adopting deep learning or machine learning technology more broadly will constantly be challenged with developmental obstacles. Such challenges would include the cost of maintenance and experimentation in real-life scenarios and finding fit-for-purpose datasets. Over time new methods and techniques will rise that will enhance machine learning in every aspect, making it more affordable and feasible for individuals and organisations to use.

OUR RELATIONSHIP WITH MACHINE LEARNING

Today, virtual assistants and chatterbots already present on certain websites are powered by machine learning and natural language processing. When we enter questions into chat-boxes they can understand what the inquiry is about by detecting and processing keywords – this is after being fed and learning from large datasets of natural language libraries and human to human text-based interactions.

This service saves both businesses and their customers a significant amount of time, by reducing the need for human-to-human interactions or waiting in virtual (or phone line) queues.

At this early stage, machine learning and natural language processing are not able to fully comprehend or grasp linguistic meanings in certain situations, but as develop they will become much more efficient assistants. Goods purchased from online-stores will reach homes quicker than ever before through machine learned route optimisation. Customers will also be provided more accurate delivery timelines and will be able track an items route in real-time.

When protective programs that defend our IT devices from malicious software are augmented with deep learning machines, they will provide an even greater line of defence. They will be empowered to do this by reacting in real-time more efficiently, drawing on thousands of different dataset scenarios. Machine taught anti-virus programs will be able to better identify and defend from threats as ill-intended hackers attempt to infiltrate a person's IT system. By being one step ahead of attackers these programs will operate in both a proactive and protective manner.

Artificial intelligence, machine and deep learning are inter-related technologies. As one advances, the others benefit from the developments in that field. Advancements in these areas will make our digital and personal lives faster, safer and more affordable, as well as creating new fields for innovation in other areas of Information Technology.

NATURAL LANGUAGE PROCESSING AND CHATTERBOTS

INTRODUCTION

The concept of natural language processing (NLP) and Chatterbots represent the perfect combination of an idea and its execution. Without natural language processing, Chatterbots would not be able to exist, as to be functional they require a base level understanding of the inputs they are receiving. Before diving into the combination of these concepts, a Chatterbot, we must first look natural language processing.



Figure 6– AI Chatbot smart digital customer service application concept
Source: Blue Planet Studio, 2020

NATURAL LANGUAGE PROCESSING (NLP)

“Natural Language processing is a branch of computer science and artificial intelligence which is concerned with interaction between computers and human languages. Natural language processing is the study of mathematical and computational modeling of various aspects of language and the development of a wide range of systems. These includes the spoken language systems that integrate speech and natural language.” (Reshamwala, Pawar and Mishra, 2013). Thereby, the field of natural language processing is the understanding of the interaction between a human’s language input; a computer’s understanding of that input; then subsequently the computer’s language-based outputs; based on its understanding of the original inputs. By definition, a natural language is a language used by a human (e.g English, Chinese, specific dialects) to communicate information, knowledge, emotions, and verbal responses to situations. These are things we as humans learn to process and understand from an early age and develop further over time. These however are extremely difficult in the abstract for a logic-based computer system or machine to interpret and understand, since a computer or machine lacks the interpretive nature (by default and by human design) to pick up the nuance, meaning and structure of a natural human language.

The field of natural language processing has come a long way in a relatively short time. A crude example of this can be seen as far back as the early 1900's. In 1922 a company called Elmwood Button Co created a children's toy called "Radio Rex"(Dr Judith Markowitz, 2021). Rex, a small wooden dog-shaped toy, was controlled using a small electromagnet that was sensitive to certain acoustic frequencies. The sensitive frequency that Rex 'responded' to was designed to be attuned to the user saying "Rex", at which point a small spring would push Rex out of home as if it was responding to the users call for it. Whilst Rex did not respond to a natural language per say, rather a frequency (that just happened to coincide with a Natural language), Elmwood Button Co created what some would deem to be the first instance of a consumer good that used natural language processing. After all, what is human speech if not groupings of repeatable frequencies? Rex did respond (in the most part) to those frequencies.

Most smartphone users today would be familiar with virtual assistants such as Bixby or Siri, both of which use natural language processing to understand and implement voice commands given by a user. The creation of these virtual assistants is indicative of the massive developments in the technology from its first iteration in Radio Rex nearly 100 years before. Both Siri and Bixby can to complex statements, not simply single words and commands from the user. The virtual assistants we use today all help to collect and collate data on natural language; every time a user interacts with one, they are giving permission to those applications (and by extension the companies that own that software) to use and collect their speech in to further develop the applications. Doing this builds a database of human speech inputs, increasing the knowledge base for the applications to learn from, furthering their understanding of the natural language inputs given to them, creating a cyclical learning environment. As proliferation of the virtual assistant increases so does its knowledge base and by extension its ability to interpret and accurately understand natural language inputs.

Humans possess the innate ability to understand the intentions and meanings behind the language we use. This is important to understand when exploring natural language processing in context of machines and computers. When communicating with them we must teach the device what our language or input means before it can action what has been requested. Therefore, natural language processing as a field can be distilled

down to the concept of teaching a computer, machine or device to understand human language (whether it be text or speech) the same way we do.

CHATTERBOTS

Now that we understand natural language processing we can really explore Chatterbots – a natural extension and real-world application of natural language processing – to its fullest. “Chatterbot” as a term was first coined by Michael Mauldin, whom created the very first chatbot ‘Verbot’(En.wikipedia.org. 2021), and was used to describe a “software application used to conduct an on-line chat conversation via text or text-to-speech, in lieu of providing direct contact with a live human agent.” (Chatbot - Wikipedia, 2021).

The Turing Test is a “test of a machine’s ability to exhibit intelligent behaviour equivalent to, or indistinguishable from, that of a human” (Turing test - Wikipedia, 2021). The standard Turing test involves two people and one machine. Person 1 interacts with person 2 and the machine; then using the responses from both person 2 and the machine, determines which is the machine and which is the person. If person 1 is unable to come to a reliable conclusion about which is which after the interactions, then the machine passes the test. In a more realistic context, it can be difficult for a user to tell if the chatbot they are interacting with on a website is a real person or simply a chatbot. The line is becoming increasingly more blurred as the technology behind Chatbots and the natural language processing they employ develops.

As a concept, a Chatterbot is something that most internet users would be familiar with on some level. Most people have visited a website before and seen the small window pop up on the screen “A service agent is here to help you”, sometimes they can be obnoxious and sometimes they can be helpful. If you have ever interacted with one before you will be familiar with the often strange syntax or manner of speaking that they utilise. Sometimes a Chatterbot may skip over certain things that have been said, instead latching on to key words or phrases and regurgitating information related to them. This is because a Chatterbot can operate in a few different ways.

One of the ways in which a Chatterbot will interact with a user is by listening for or registering key-word inputs. These key-word inputs will trigger the Chatterbot into responding in a pre-determined way, either by displaying a list of related information (to

the language input) or by responding with a pre-programmed response. An example we have previously looked at is that of the Siri Virtual assistant. By nature, Siri is always waiting for an input, continuously listening for a key language phrase before running its full programming. When the key-word is spoken (“Hey Siri”), Siri will respond to the input and begin actively listening for further natural language input.

In another example, a Chatbot may be used by an online retailer or a company with a digital presence to increase its customer service availability. In this way, an online service provider can filter through legitimate customer queries and funnel them to live agents or filter more simple customer questions to help forums or website help sections. This also allows a business to filter out actual sales queries and drive them towards a real customer service agent, allowing a business to focus its finite staffing resources on sales and customer acquisition rather than general help questions.

There can often be confusion from a customer’s perspective about whether they are dealing with an actual person or a Chatterbot. While many companies do go to the lengths of explaining that their digital help assistants may be a Chatterbot, some do not, which is something that a consumer may find problematic if they try to use complex sentence structure, syntax or colloquial terms while interacting with the Chatterbot. This will cause the Chatterbot to misunderstand or read the wrong input, causing it to rely on incorrect information or miss the point of a statement or question entirely.

An example of this reports Authors interactions with a Chatterbot can be found at the end of this report.

THE NOW

Nowadays, Chatterbots are everywhere. According to data from 99Firms(25+ Chatbot Statistics for 2021 - 99firms, 2021), the “chatbot industry is forecast to grow from \$190.8 million dollars in 2016 to over \$1.25 billion dollars in 2025”. With “47% of businesses having plans to add Chatbots to their platforms in 2021”, with at least a separate “40% of companies planning to introduce virtual assistants”.

The Chatbot industry is also overtaking the mobile app market, with “50% of companies planning to make more investment in integrating a Chatbot or virtual assistant in their website or programs than on developing a mobile app”. Furthermore, over “35

million people in the US alone interact with a chatbot at least once per month” (virtual assistants included).

From a business’s perspective, “data shows that chatbots receive a higher customer satisfaction rating than their human counterparts. With 87.58% of people reporting a positive satisfaction and interaction rating when using a Chatbot”. They also help a business get a lead and then close a sale, with “26% of sales reportedly starting with a Chatbot interaction”.

From a customer complaint resolution perspective, “80% of brands surveyed by Technology Review reported a reduction in call volume processing” as the Chatbot is able to filter out and funnel customer calls and enquiries to the correct customer service operators. “90% of brands reported measurable improvement in complaint resolution”(25+ Chatbot Statistics for 2021 - 99firms, 2021).

At this point there is simply too much invested by customer facing companies for the technology to no longer be present. The pure costs saved by businesses, far outweigh the negative impressions a person may initially have about interacting with a Chatbot or virtual assistant. The fact that over 87% of people have a satisfactory interaction with a Chatbot is even more indicative of their staying power. When a product can reduce a business’ costs, keep customers happy and help generate sales, it means it will quickly become a staple of industry. At the cost of human-to-human interaction, the Chatbot is here to stay.

THE FUTURE

As the databases for natural language processing grow and as Chatbots become ever more prevalent, intelligent and advanced we will see their potential uses explode. Think of all the interactions you may have with a person in a customer service facing role through-out your day, could their job be taken by a Chatbot or virtual assistant? Customer call centres are the first jobs at risk in this environment. A customer call centre employees’ job is to handle customer enquiries, if these customer enquiries can instead be handled by a Chatbot (that has a reportedly higher level of customer satisfaction), it would make financial sense for the business employing the call centre to transition to fully automated digital system that has no down time - a Chatbot.

However, most consumers still prefer to interact with a Human service agent when possible so whilst the initial fear of the call centre role disappearing may seem well founded, Chatbot integration into customer service may in fact allow a call centre agent to spend more time interacting and helping a customer than previously possible. This is because the Chatbot can collect information before a customer service agent becomes involved (name, age, account verification details) and even funnel the customer to the customer service agent best suited to help them. A Chatbot is also able to help a customer with entry level questions and provide answers, eliminating the need for a customer agent to become involved in the first place.

SUMMARY

While humans have always erred on the side of caution with Artificial Intelligence, (one need only look at science fiction to see the man's worst fears about Artificial Intelligence come true) a chatbot is not something we need fear. A Chatbot learns by seeing, by interpreting and by understanding our languages and only responds to our inputs. Yes, if given the wrong learning material a Chatbot may give some sinister responses or have its purpose twisted (see the growth in Artificial Intelligence present in Sex Robots and how a Chatbot could be implemented), but these apply to all technologies their advancements in one way or another. A Chatbot used to help us solve our customer service issues, teach us a new language or skill or even as a point of interaction for our more isolated members of society is a good thing benefitting all of humankind.

EXAMPLE CHATBOT INTERACTIONS

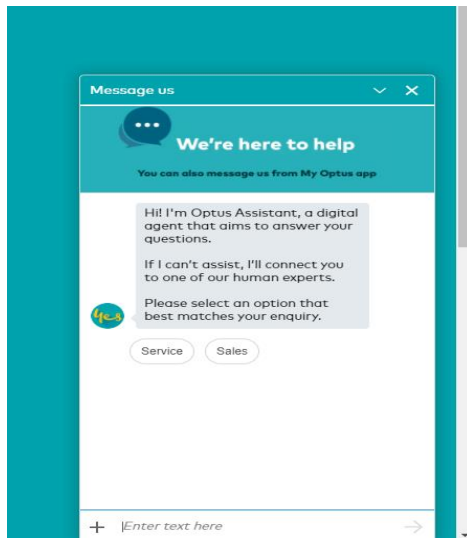


Figure 7- Initial interaction options with the Optus Chatbot ⁸

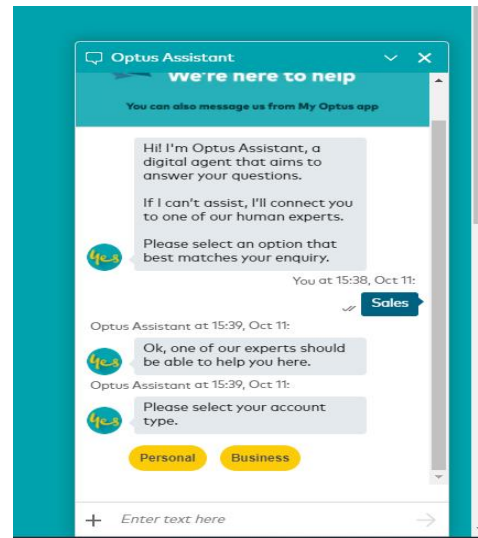


Figure 8 - Choosing an option pushes the user through to more funnelling options. ⁸

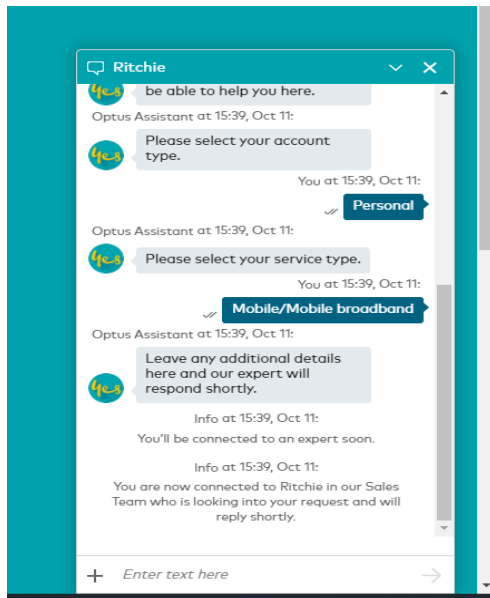


Figure 9 - Choosing a further option then funnels the user through to a customer service agent. ⁸

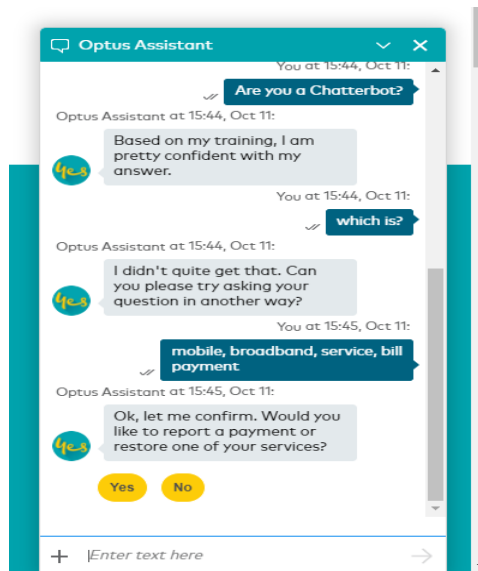


Figure 10 - Questioning a chatterbot can lead to some strange answers. When entering a Keyword loaded response the Chatterbot has a difficult time ascertaining the correct response. ⁸

AUTONOMOUS VEHICLES

INTRODUCTION

An autonomous vehicle, one that can operate entirely independently from the inputs of a human driver or pilot, was once considered to be science fiction. However increasingly that which we once considered a distant dream is becoming our reality. Think of your day-to-day life, where the use of a car or vehicle fits in.



Figure 11– Automatic car speeding
Source: iStock, n.d

Would your day-to-day experience be different if all the vehicles on the roads were autonomous? Would roads be designed differently for a machine to navigate them? Or would the way we design our cities change? We can't examine what an autonomous vehicle is without taking a brief look how it will affect us, its creators.

AUTONOMOUS VS AUTOMATED

Autonomous vehicles are sometimes confused with automated vehicles. By design an automated vehicle is still reliant on a human's inputs for its operation. Automation in and of itself is not a new concept, (D, 2020) therefore, what really differentiates autonomous vehicle apart from automated vehicle is that an autonomous vehicle has a greater level of situational awareness and interaction with its surrounding environment. It can act beyond basic instructional and mechanical functions. They are self-aware and they can "think" before making decisions.

An example of this is that some self-driving, more autonomous, cars can decide which route to follow but less autonomous, more automated, cars require direct instructions and inputs from their owners. Whilst driving, an autonomous car can decide what lane of the road to follow whereas an automated car can only suggest the best lane for driving, the operator of the vehicle must make the change manually.

AUTOMOTIVE AUTONOMY

The Society of Automotive Engineers divides autonomous vehicles into five levels (ISO & SAE, 2021). Each level represents the level of human input into a vehicle to operate itself.

- Level 0 is defined as 'No Automation' and is fully operated by humans.
- Level 1 consists of 'Driver Assistance' and the vehicle can control steering or speed in some circumstances to assist the human driver.
- Level 2 is 'Partial Automation' and is similar to Level 1, except that the vehicle can control both steering and speed.
- Level 3 is defined as 'Conditional Automation' and the vehicle can control both steering and speed under environmental conditions with human driver's oversight.
- Level 4 is 'High Automation' which allows the vehicle to drive itself under normal environmental conditions without human oversight.
- Level 5 is 'Fully Autonomous' it can operate without any human input.

Currently, a considerable percentage of autonomous vehicles in the world market fall into the Level 3 category.

The most advanced self-autonomous cars are equipped with systems that enable them to perceive their full environment and surroundings, plan their routes and track and adjust their trajectories accordingly. As systems like these develop, machine learning and autonomous driving obstacles such as safety, live traffic information and changing road conditions will be overcome. More sophisticated sensors will make autonomous cars more aware of pedestrians and animals on the roads. Geometric methods, sensor and camera technology, developments in artificial intelligence, neural networks and machine learning will boost the capabilities of autonomous vehicles. However, one key delaying factor in the development and advancement of autonomously driven vehicles is (Li, et al., 2021) are the sensors that feed and relay the information to the vehicle, allowing it to autonomously navigate its way through the road system – making them safe for use on our roads.

As autonomous vehicles are heavily reliant on advancements in machine learning ([See our report on machine learning](#)) and artificial intelligence, human researchers,

developers, and inventors will still play the most important role in the evolution of autonomous vehicles for the time being. As commercial transportation, logistics and maritime shipping companies adopt more automatic vehicles (with more and more autonomous features), Humanity will begin to adapt to the use of, and the idea of autonomous vehicles playing a more central role in our lives.

OTHER USES FOR AUTONOMOUS CAPABILITIES

Most airplane manufacturers utilise a technology called autopilot. (Chowdury & Deka, 2019)

The autopilot system in aircraft leans more towards the automated end of the spectrum, allowing pilots to focus their attention on inputs requiring greater skill and experience when flying. Many maritime companies also have ships with automatic captains that assist human operators of ships with both simple and complex procedures. Governmental or commercial railway organisations use automated systems that arrange train passages and routes. Air drones help government departments and agencies with tasks such observation, surveillance, and firefighting. Some agricultural groups even utilise drones that help them to maintain their crops and protect their live-stock and production buildings.

Global military powers have been early adopters of autonomous vehicle technology, as is the case with most new and emerging technologies, helping to fund and develop research at an astounding rate. Maritime Autonomous Vehicles (MAVs) have become increasingly common place in Navies around the world. This was showcased when Saudi Arabian forces intercepted remote-controlled boats carrying explosives and targeting an oil depot in Yemen (Klein, et al., 2020), deploying MAVs to respond to the threat.

The latest generations of fighter planes and jets are also being integrated with artificial intelligence that eases the burden on human pilots. For example, the Russian Air Force's new Sukhoi Su-57; "advanced avionics are integrated into the aircraft with a high level of controlled automation and intelligent crew support. The improved avionics will reduce the pilot workload, allowing him to focus on tactics and strategies. Furthermore, the fighter will enable the pilot to exchange data and communication in real-time with control systems on the ground and with air groups." (Airforce Technology, 2021). Whilst not an entirely autonomous vehicle, the level of autonomy given to the aircraft

puts it on the cutting edge of air force fighting capability.

THE AUTONOMOUS FUTURE

Looking to the future, there is a high degree of likely-hood that driverless (autonomous) cars will begin to feature more heavily on our suburban roads. Furthermore, as artificial intelligence learns to predict and control traffic conditions (smart freeways, smart traffic lights) we will have less congestion on roads. Autonomous cars will heavily reduce the dangers of reckless driving and collisions. This in itself opens up a whole range of discussion on artificial intelligence ethics and morality.

The amount of people employed in the transport, logistics and driving industries will be severely impacted. As we see more and more autonomous vehicles on the roads, we will also unfortunately see a number of people lose their jobs. The demand for in-person taxi drivers, bus drivers, train operators, truck drivers and traffic controllers will be reduced heavily. This may also have a flow on effect to policing, with humans no longer causing the same amount of road accidents as autonomous vehicles. This could then have flow on effects, impacting revenue brought in by town or city through traffic fines and infringements.

Military personnel may also be replaced with military drones and robots. Since machines have significantly more resistance against fatigue and energy drain, this will pull human soldiers away from the front lines, reducing casualties and allowing the human element to focus on tactics and logistics. Naval vessels can be enhanced with undersea drones, fighter airplanes will be assisted with unmanned aerial drones controlled by both the human pilot and artificial intelligence augmented auto-pilot. Law-enforcement organisations can also benefit from aerial drones that will increase their surveillance capability. Enhanced operational capabilities of the military and police will make civilian lives' safer, as the police are able to better focus on more "impactful" crimes and offences outside of traffic infringements.

In the manufacturing industry, autonomous vehicles will significantly increase productivity, quantity and quality. Manual labour will be replaced with automated production robots, assembly lines will be controlled and maintained with autonomous control devices. Packaging services will be provided by automated mechanical gadgets, stock-in services will be provided by autonomous forklifts and other shifting mechanisms.

These innovations will most likely reduce the need for human labour. Many companies will decrease the number their number of employees to cover new expenditures like the purchase and maintenance of autonomous machines. Although we will have more abundant, more affordable, and higher quality products, we will also see the unemployment rates of people employed in manufacturing reach levels similar to the years after the Industrial Revolution.

OUR AUTONOMOUS LIVES

When cars become fully autonomous, humans will be able to use the commute times for other activities. Imagine being able to get work done while commuting or attending video conferences or watching a movie, all while your car drives you to your destination. After an evening on the town or at a party, our cars will be able to pick us up and take us home. When we take a taxi, we will not have to instruct the driver what route to take, we will simply be able to provide our address and the artificial intelligence and autonomous driving system will do the rest. Busses and other public transports will be able to operate 24/7 as they will no longer need to rely on human drivers being available, the cost to operate these services may also be reduced. Elderly people will feel safer while being in a car as the advanced sensors and artificial intelligence of the car will have sharper reflexes and quicker decisions. When our family members, relatives or friends borrow our cars we will not worry about how they will bring them back.

Travelling in airlines, railways or maritime routes will become much safer due to transportation being augmented with artificial intelligence, neural nodes and learning machines. People with travelling phobias will feel safer and more secure when they take public or private transports. Obtaining a drivers' license will become easier (or entirely irrelevant) for potential drivers as they will be assisted by smart cars. The burden on legal systems and courts of law will be much lighter when autonomous vehicles become more intelligent as they will commit little to no traffic offences. We, owners & drivers of smart cars will not have to worry about acquiring parking tickets, paying for parking fees or sustaining traffic penalties.

The use of autonomous vehicles by the worlds militaries is when the line between positives and negatives because blurred. On the positive side of things, it means a greatly minimised risk of injury or death to soldiers and front-line operators. Especially in areas where Improvised Explosive Devices may be used as an automated vehicle

can be used to clear the area ahead of time. On the negative side of things, the increased use of autonomous vehicles will likely mean that the use of unmanned Drones, Jets and offensive vehicles will increase (because of the positive aspects mentioned above). This will mean the increased likelihood of the misidentification of targets, resulting in increased non-combatant deaths or injuries.

When we purchase items produced by automated machines, we will have the assurance of acquiring a product of higher quality. Most of our goods will be made by smart and efficient robots with minimum risk of fault and help reduce the injury risk to workers. These innovations will increase our life quality in almost every way.

Autonomous vehicles are the future of the transportation and logistics industry. While jobs may be lost in their implementation, they will not be lost entirely. It will take a fleet of engineers and mechanics to sustain the autonomous automotive industry. Upskilling and retraining may be required, but the proliferation of autonomous vehicles will ultimately increase the quality of human lives (imagine never having to wait at a traffic light again) and potentially save them with a massive reduction in road accidents. At first it may be scary to place your life in the hands of an artificial intelligence capable of driving at high speeds, but is it that different to placing your life in the hands of another driver. Our children may never know the difference.

BLOCKCHAIN-BASED PUBLIC KEY INFRASTRUCTURE

INTRODUCTION

As businesses begin to adopt cloud computing, moving away from the traditional centralized computing model, the typical user base now has the ability to access enterprise systems and exchange corporate data from their personal devices without the requirements of a VPN or using corporate assigned devices. The ease of accessing these systems have also increased with the likes of mobile devices such as tablets



Figure 12– Security Logo
Source: Pixabay 15AD

and smart phones over a cellular network and will continue to increase as 5G is rolled out. This presents a problem as these BYOD devices won't have a corporate assigned digital certificate which the Public Key Infrastructure requires in order to encrypt data transmissions and establish trusts between different networks. Sure, a cloud service (whether this is AWS or Azure) will have their own Certificate Authority (CA) and their own digital certificate to hand out but the end user accessing these systems will not have a digital certificate assigned by a company from whom they represent. As we move towards a decentralized computing model, a new method is needed to improve the security of these devices. First, we need to understand how the public key Infrastructure works.

PUBLIC KEY INFRASTRUCTURE

WHAT IS THE PUBLIC KEY INFRASTRUCTURE?

The Public Key Infrastructure (PKI) has been around for years and binds multiple technologies together to create trust and secure data exchanges over the internet (Posey, 2005). As the Internet is a public space allowing any computer to communicate with other computer networks, much like other internet service protocols (such as DNS) PKI is what allows different networks to communicate securely and provide evidence that the data is coming from the intended source. The technology behind PKI is based on distributing digital certificates to clients and between these digital exchanges are different levels of trust authorities. Digital Certificates are signed using a hash, contents encrypted via a private key (kept by the owner or CA) and a public key to decrypt the contents of the data and other metadata.

The Certificate Authority (CA) is responsible for auditing, issuing and revoking digital certificates. Some corporations will host their own CA which a security technician will be responsible to maintain the companies' public keys, the Certificate Revocation List (CRL) and Auditing. A Registered Authority (RA) who verifies digital certificate requests. In layman's term, identification of data exchange on the internet is similar to how we use passports in the real world (Fruhlinger, 2020)

Authority (RA), The RA will confirm the user's identity and pass over to the Certificate Authority (CA) to issue a digital certificate. The Validation Authority (VA) verifies the status on the digital certificate and updates it if necessary. Not mentioned in the graph is the Certificate Revocation Lists (CRL) which the CA manages. These are where all the revoked digital certificates are stored (Yang, 2021) PKI can get quite complex when adding more trusted authority levels and these are generally used for reseller CAs such as VeriSign or GlobalSign.

Outside of communications to a Web Servers, there are other ways in which PKI can be involved, such as securing communication to a database server, encrypted email communications, used with window's domain networks, securing Internet of things (IoT) devices, physical access cards for building access (Fruhlinger, 2020)

ISSUES WITH PKI

Public Key Infrastructure has helped keep networks secure for years but it doesn't come without its flaws. In short, PKI uses many different components which increases the attack surface and can be prone to user error. CA's can be hosted internally, depending on how the company manages their IT Infrastructure, which means an administrator (a human) maintains their private and public keys, management of the Certificate revocation list (CRL) and maintains the CA server itself (Grimes, 2015). This becomes a concern when users begin to access their work on an unmanaged BYOD device, operating on their private network with no VPN Tunneling back to a corporate network.

This is just an example of a company handling their own CA server internally but there has been known evidence of CA resellers mishandling their digital certificates. One example is with GlobalSign who manage to take down a portion of the internet, sites that went offline include Wikipedia, Dropbox, and Financial Times (Cromwell, 2021)

BLOCKCHAIN

WHAT IS BLOCKCHAIN?

Blockchain is decentralized, operating as a peer-to-peer (P2P) network. The core of the technology is performing transactions between multiple participating computers (nodes) that store the data in a distributed manner. Each computer participating in the blockchain will have its own copy which is updated whenever a new transaction is

completed, this creates a new block of data (hence the name). The blocks within the blockchain will include the data, the Hash and the Hash of the previous block. Depending on the type of blockchain you can store any value, whether this is user data (document or file), money or even a digital certificate. The block also contains metadata which could contain the identity of the user or transaction logs (H., 2018)

Blockchain gained popularity with its first widely used digital currency, Bitcoin. Blockchain made it possible for these cryptocurrencies to exist as the system itself acts as a public ledger that captures transaction history. Coupled with the hashing algorithm used, this system is impossible to crack. The beauty of blockchain is in its decentralized computing, the file (depending on the blockchain) will update every 10 minutes to all the nodes which offers a level of redundancy. The other benefit is only being able to write new data on a blockchain. Through the hash file algorithm that this technology offers, you cannot update or crack the previous saved blocks as this will change the hash and that piece of data becomes (Token Metrics, 2021). Below are graphs on how the hashing mechanism works within a blockchain.

Hash intact:



Figure 15– How the Blockchain Works : Source (H., 2018)

Hash changed – chain broken:



Figure 16– How the Blockchain Works: Source (H., 2018)

Another feature that blockchain contains is proof-of-work (PoW) which acts as a consensus. Proof-of-work is how a cryptocurrency mines and adds to the blockchain, this is achieved by solving mathematical problems which is how the new block is added to the blockchain. The nodes in a blockchain are referred to miners and the process for solving these mathematical problems called mining (Learn, 2020).

As blockchain has developed through cryptocurrencies, it has become increasingly noticed for its potential for decentralized data storage. This will cater for the emerging IoT devices and data exchanges from BYOD devices to cloud systems (Nexus, University of Michigan, 2020) Proof-of-work (PoW) offers a timestamp mechanism in which the nodes on the network solve computational puzzles to create the next block and push over the network and add to the blockchain (Learn, 2020). This mechanism will prevent denial of service attacks due to the scope of the peer-2-peer model that blockchain works on. The only downside to PoW is the sheer computing power that is required to mine the blocks and what is concerning is other countries are contending with mining crypto which is using the earth's resources (Statista, 2021). Despite the usage of blockchain for cryptocurrencies, the technology itself will transform industries such as supply chains, retails, manufacturing, financial services and even security.

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WHAT IS BLOCKCHAIN-BASED PKI WILL FIX

As Blockchain technology is used more outside of the cryptocurrency space, we will begin to see the Public Key Infrastructure running on blockchain. As of this point in time, the technology is still in development, but it will resolve several issues that we see with PKI. One of these issues would be the need for a Certificate Authority (CA), with Blockchain Integrity and Auditing built into the technology there is no longer a need for a 3rd party to oversee the handling of certificates and public keys. This is simply because of how Blockchain works, which is a distributed ledger which saves meta-data based on transaction history. However, in this context for PKI, it would be digital certificates and public keys (Fedotov, 2019)

This will also take the burden off IT administrators having to host an on-premises CA and eliminate user error with mishandling keys, server maintenance or malicious attacks to their CA servers. As the PKI model was built to support the older centralized model which companies are increasingly moving away from due to cloud computing, mobile devices, and BYOD devices. Blockchain is built for peer-2-peer

communications which is distributed and supports the current trend for companies moving towards cloud systems. Because Blockchain is distributed, there is built-in redundancy as multiple nodes over the network are downloading the new blocks via Proof-of-work (PoW) (Remme, 2020).

The only downside to blockchain is that there's no governing control, this is due to the nature of the technology working as a peer-2-peer model, however there is great trust within the code that drives blockchain. As Satoshi Nakamoto writes: "*The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers.*" (Nakamoto, 2008) As long as this is the case, blockchain-based PKI will be revolutionary within the cyber security space.

OUR THOUGHTS

Currently for work, we use my personal computer when working from home and most of our users in our organization do the same, this creates a challenge for our organization to keep these devices secure. However, BYOD devices are becoming increasingly popular and sure, you can enrol the computer or mobile device into a Mobile Device Management (MDM) system, but users do not want their companies' IT team to be able to monitor their activity on their personal computer. As it stands, there are not many measures preventing a user's access to cloud systems. Users prefer to use devices that they're more familiar with (i.e their personal computer), whether it is because of their preferred OS, higher specs, or configurations etc. At least with blockchain-based PKI, this would cover some of these implications. Aside from blockchain-based PKI, there are other security vulnerabilities but what is important to note here is that if you are representing a company then there needs to be evidence that the data came from the device that represents your company, this will increase integrity and confidence within organizations and the vendors that they conduct business with.

Another benefit of this technology is no longer needing to administrate an on-premises CA server. None of the IT technicians on my team are trained security professionals and have to depend on a managed service provider (MSP) to look after some of these systems. As technicians looking after a customer, there have been cases of half completed work, "band-aid" fixes or simple mistakes like powering the server back on after

an update. Although they have the expertise and skills required to operate these specialized systems, they can lack the care and attention that an employer of the company network provides. So far, this hasn't been the case for our CA server but if it did, the repercussions could be catastrophic for our company.

On a broader level, blockchain will increase secure data transmission over the internet and reduce the level of human errors from CAs. Although without CAs, there is a level of concern as to who monitors the identity. Unless you are part of that blockchain, it will be very difficult for an ethical hacker to prevent criminal activity to occur due to the security and lack of overarching authority.

PROJECT IDEAS

OVERVIEW

Proper inventory management is the key to any business. One of the largest costs for many businesses, aside from staff, is that of inventory and it takes a great deal of time and effort to keep track of all a business' inventory – imagine a product that alleviated this issue. A product with a full suite of tools, options and in-built systems that gave you full control of your inventory from the purchase point, to the sell point and all the stops in between. Welcome to “stockIT”.

stockIT is designed to scale with the business from the ground up. Whether it be a small restaurant or a multi-site processing facility, stockIT has the tools and systems to ensure that you can accurately keep a track of all your inventory.

The motivation for the creation of stockIT was to create a product or software suite to bridge, what we as a development group saw as, a gap in the market. There are an array of products that can carry out one or two of the functions of stockIT, but none that can fulfil the full suite of needs a customer requires to run an efficient and profitable business. Stock taking applications or programs allow a user to count inventory on hand; PoS (Point of Service) software allows a user to record sales and sales data; accounting software enables a customer to track purchasing and invoicing; and more traditional purchasing methods (emails, phone calls) only allow a customer to place an order. There are very few products out in the market that allow a user to perform all of these functions from a single location and none that are as effective or as

affordable for businesses, irrespective of their size. stockIT acts as the conduit for these operations, it feeds the data collected from the different points at which they can be executed into a single repository. Placing an order through stockIT allows the supplier to send an invoice which can then be processed using account software. Creating and receiving a supply purchase with stockIT allows the software to populate the inventory data in the PoS system. Think of stockIT as the root system of a fruit tree, it collects the nutrients – the inventory data - and feeds it to the branches where the fruit grows.

WHAT IS INVENTORY MANAGEMENT

Inventory management, by definition, is “the process of ordering, storing, utilising, and selling a company’s inventory. This includes the management of raw materials, components, and finished products, as well as warehousing and processing of such items.” (Inventory Management Definition, 2021). It is the process by which a company brings a sellable good or product to market. It is the bedrock of an efficiently run and profitable company.

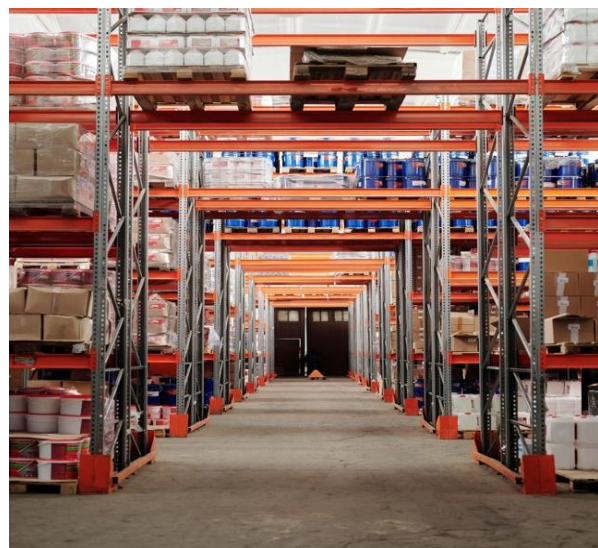


Figure 17– helves on a Warehouse
Source: Lily ,25AD

The key principles of inventory management are:

- Purchasing:
 - purchasing relates to the buying of Raw goods or Ready to sell goods:
 - raw goods can be raw materials, ingredients or components; and
 - ready to sell goods are finished products. Clothing, materials, consumer goods, electronics; and
- Production:
 - production relates to the purchasing of raw goods. Proper inventory management tracks a product from its raw goods state – usually a combination of different raw goods – through to its classification as a ready to sell good; and
- Holding Stock:

- holding stock relates to the storage of goods. Efficient inventory management negates a siloed style approach, keeping track of raw and ready to sell goods in a simple and clear way; and
- the improper storage of goods cost companies millions of dollars each year. This can be due to a multitude of factors, improper storage (spoilage), misidentified storage and improper stock rotation to name a few; and
- where is a good stored, how is it stored, why is it stored this way;
- Sales:
 - tracking sales – sales will pull from raw goods and ready to sell goods; and
 - accurate tracking and accounting are required for accurate representation to the consumer of quantities and amounts available for purchase; and
 - sale tracking informs the retailer/company of a demand for a product. This data is fundamental to forward projections and future purchasing – this data informs the entire inventory management process; and
- Reporting:
 - data is everything when it comes to inventory management. Much like sales, without accurate reporting and accounting all the demand in the world for a good or product will not matter if a company cannot keep track of a good throughout its purchasing, production and holding lifecycle; and
 - predict trends, notify of shortfalls, overstocks, process auditing, match raw goods in with ready to sell goods out.

According to research from the retail analyst firm IHL Group: overstocks cost the global economy \$471.9 billion each year; internal process failures account for \$284.9 billion; personnel issues \$259.1 billion and data disconnects and systems that are not integrated cost the global economy \$222.7 billion. The IHL report also states that: “retail CEOs are more challenged than ever to answer the growing omni-channel demands of consumers while providing profitable growth for owners and shareholders,” said Kevin Sternecker, CMO of OrderDynamics. “With internal process failures, disjointed

data and siloed organizations, the answers C-level retailers need are almost impossible to attain without access to new, innovative technologies purpose-built to deliver the full potential of an organization.”. (Businesswire, 2021)

Proper inventory management has the potential to save the global economy billions each year and this is where stockIT has the ability to make the greatest impact.

STOCKIT



Figure 18 – Source: Adobe Spark, 2021

stockIT is a backend facing software suite that allows the user (a company or business) to track their inventory from purchase to sale and at every point in between. stockIT’s data driven approach allows the user to make informed decisions about inventory management, minimizing the risk of personnel failures and human error, in the tracking, purchasing and fulfilment of orders and inventory.

With a heavy focus on the Retail and Hospitality sectors, stockIT allows its users to keep track of inventory from a variety of different SILOs [Standalone Inventory Locations] (stores, locations, sites), or a single location, and see at a glance the current inventory on hand. This enables users with different SILOs to see the bigger picture of their organization, but allows them to identify shortfalls or issues at the micro level. Resolving issues at this level allows for business to stem issues before they grow and have impacts on a larger scale. It also allows individual SILO managers to see how small changes on their end impact business more broadly. Only have a single location for your business? No problem. The scalability of stockIT means it can be utilised by a business of any size to help them achieve a greater level of efficiency in their inventory management, the key fundamental functionalities of stockIT apply to a business of any size. This negates the need for small and medium business to seek alternative business solutions as they seek to grow, making stockIT an ideal tool for growing businesses to use.

A clean and user-friendly interface is integral to any piece of software in today’s day and age. The hospitality and retail industries can be prone to staff change, especially before and after peak service season towards the end of the calendar year. Further to this, staff will most likely possess a range of different levels of technological literacy.

Software that is simple and easy to use is important in ensuring that it is accessible, functional and thus fit for purpose. stockIT uses simple drop down menus and click-through commands, allowing the user to spend less time navigating systems and more time focusing on their work, whether that be customer service or deliverables.

UNIT PROFILES

A unit profile is important when entering an item of inventory for the first time in stockIT. Efficient inventory management starts with entering the right information into a unit's profile section. This information is carried forward through-out the life of that item in the stockIT system. In doing so, it creates a robust unit profile section enabling the user to give the software the necessary information for that product is at the core of stockIT's functionalities.

stockIT allows the user to assign an item in the inventory:

- SKU's (Stock Keeping Unit):
 - For tracking, reporting, purchasing and sales; and
- storage Zones/SILo availabilities:
 - where is a product stored in the SILo or Single Site; or
 - where product is available at all SILos; and
- recipe and Ingredients – raw goods, hospitality, inventory creation:
 - assign a product to be a part of a recipe; such as
 - quantities/amounts; or
 - multiple values from a single unit; or
 - shared recipes and ingredients; and
- custom inventory alert status:
 - safety stock notification level; and
- applicable inventory management formulae:
 - which formula is used for this item:
 - economic ordering quantity
 - just in time ordering
 - days inventory outstanding
 - reorder point formula
 - safety stock; and

- alerts given to user based on the formulae when stock reaches certain points. Custom points can be set according to order days and delivery lead times; and
- supplier information – useful for reordering through stockIT:
 - who is the product supplied by; the
 - average lead times; and
 - contact details; and
 - store supplier contracts; and
- purchaser information:
 - who is the product supplied to (if wholesale); the
 - SILO availabilities (if moving products to different SILOs); the
 - Artificial Intelligence integrated demand scaling; the
 - retail/direct to consumer; and
- accounting details:
 - costs and margins; and
 - discount availabilities; and
 - tax codes and information; and
 - prices:
 - Specials/combos/pricing links; and
 - invoice creation and generation for internal stockIT systems:
 - This is fed to a PoS system and a users accounting software; and
- QR code generation:
 - QR codes can be read by a variety of smart phones; and
 - useful for storage locations and large products:
 - Scan a QR code at a zone or location and see a full list of units in that area; and to
 - create a QR code for a product, zone or location within the stockIT software.

While the Unit Profile list may seem exhaustive and appear like a lot of information to be entered per-product. This information is key to a business in getting the most value out of their inventory management. QR codes, stock locations and SKU's give a business a wealth of information when it comes to tracking the physical location of their

inventory as it moves through their business; as well as tracking the items through their journey as data through stockIT.

Recipe information is incredibly important, being able to assign a raw good item as part of a recipe (whether it be in a hospitality situation or as part of manufacturing) gives the user the ability to track that item as it assimilated into another product. Being able to see total finished goods as a percentage or as a part of a larger combination of raw goods gives a wholistic view to the user. Stock alerts and notifications come in handy here when a specific raw good is running low and is used in the creation of a finished product, stockIT can notify the user of the shortfall and bring attention to the problem. The alerts can be tailored within the system to set safety stock levels for each item, as part of both the raw good and the finished product itself, in turn triggering two alerts and feeding into the re-order and accounting section of stockIT.

A clear record of accounting is vital to the success of a business. A business must know where each dollar is going so knowing how much capital is tied up in each item of inventory, the margins, tax implications, storage costs and possible profits are very important. Through stockIT, a user is able to enter this information when creating a Unit profile for each item of Inventory. This gives the user an overview of their currently Inventory liabilities, what inventory items need to move, what they have too much of and the costs and profits associated with each item.

THE SOFTWARE

Created with the end user and their required functionality in mind, stockIT is a full-service suite of software that integrates into your PoS system. Inventory data can be stored locally for increased efficiency for separate SILOs, allowing individual SILO users to run their own process auditing in real-time before pushing the information to the larger organisations cloud storage. Inventory information can be pulled from the organisations cloud storage to also provide SILO's with the total inventory of the organisation; or shared between individual SILO's if inventory needs to be shared between different sites or to point customers towards availabilities of inventory. Multiple users have access to the live stockIT SILO map and any changes made by each user can be either updated in real-time or when a push is made. Back-ups are stored in a central organisational SILO to avoid mishaps with a custom back-up timer available for all users. Multiple back-ups can be stored to ensure data validity and accuracy.



Figure 19 – Example of stockIT's SILO system
Source: Spark Adobe - stockIT SILO Graphic, 2021

This dual pronged approach to the management of the inventory data (local and cloud storage) means that a company has a greater flexibility, as to how their data is stored and handled. This increases the efficiency of the workflow on a local level, reduces technological disconnects and provides a greater level of overview and inventory management on a company wide basis.

The primary focus of stockIT is to provide a clean, simple to use inventory management and inventory data stor-

age system, whilst providing a high level of integration with established PoS. By integrating stockIT with established PoS systems we avoid having to create an entirely standalone fully packaged software suite, a jack of all trades, instead allowing us (the developers and creators of stockIT) to focus on the core functionality of our product to really maximise its capabilities.

The roadmap and endgame is for stockIT to run on a variety of operating systems, however initially our primary focus will be Windows and Android based architecture. This is because windows systems are so prevalent in the market already, meaning a smaller barrier to entry for the user and customer. Android is the natural fit alongside a Windows system as both already have an excellent level of integration. stockIT is designed to run as a program that can be installed on these devices, without the requirement to solely run as a browser based system – this alleviates concerns surrounding cloud connectivity and allows for better functionality for the software.

CORE FUNCTIONALITY

Inventory management is not always seen as an exciting aspect of a business' operation, it is an often overlooked and undervalued practice that is fundamental to a business' bottom line and financial success.

Data driven reporting allows a business to make key decisions with the backing of hard data. This takes the guess work out of the decision, giving the business a greater level of confidence when making decisions. stockIT allows a business to see more holistically: purchases sales, accountings, current inventory levels, supplier lead times and current trends and predictions, regarding their inventory levels and sales. Having all this information in the one piece of software, not tied to any individual person or spread across multiple spreadsheets or programs, means that a company can easily manage a large array of information and make the small decisions that will yield big results.

stockIT's supply chain integration – either from data fed by suppliers also using stockIT or inputted using the unit profile section – gives a business the ability to effectively plan for in the short and long term. Data fed from suppliers using stockIT gives the purchaser the real-time availability and delivery lead time for a product. Direct purchasing integration of stockIT enables a business to place an order from within the stockIT software directly with a supplier. The item inventory information is then inputted by the supplier and “pushed” to the purchaser for acceptance with the purchase delivery. This process negates the purchaser having to manually enter the details of an invoice to keep inventory information up to date. It enables the purchaser to approve, deny or amend a supply invoice on receipt of delivery. stockIT's software then records the time between purchase order and purchase delivery to create the purchase lead-time. This lead-time is then updated with each re-order to establish a base-line and average time for delivery.

When a supplier is not also using the stockIT software, an order can still be placed by the purchaser directly to the supplier using stockIT. An order invoice is then created within the software based on the information in the purchase order, this is when the delivery lead-time counter will begin. Rather than the supplier then being able to push the supply invoice to the purchaser, the purchaser needs to wait until the delivery is received. At this point the purchaser need only confirm the information in the previously entered purchase order is correct within stockIT, deny the purchase order, or amend the purchase order with any different delivery amounts or prices. While the process remains straightforward and fairly simple in both scenarios there is a clear advantage when both supplier and purchaser are using stockIT. It allows for a greater

level of symbiosis between both parties, making the relationship between purchasers and suppliers stronger.

To really get to the core of the functionality of stockIT, it's best to look at an example scenario so that we can run through all of the features and functionalities.

SCENARIOS

In understanding the core functionality of stockIT, it is useful to explore some different scenarios;

TOMS BAR AND GRILL

In this scenario, a hospitality business called “Toms Bar and Grill” is placing an order with a long standing supplier of Fresh Fruit and Vegetables. While Tom knows from personal experience that he has a busy weekend in sales coming up, stockIT is also on the case and sends Tom an alert about low stock items. The alert is based on historic sales data fed from the PoS system to Tom's stockIT software and lets Tom know that mushrooms, tomatoes, lettuce and onions are all running low. stockIT knows that Tom sells a large amount of pizzas and burgers on the weekend, compared to his usual weekday sales, and knowing this alerts him that he will not be able to sell his usual weekend quantities of pizzas and burgers without running-out of the aforementioned vegetables. The alert also comes through just in time for Tom to be able to place the order and receive the goods in time for the weekends service.

Tom logs onto his stockIT software before heading home for the night, places an order with his Fresh Fruit and Vegetables supplier (whom also uses stockIT) and receives confirmation of the order and lead-time from the supplier.

The next afternoon Tom arrives to find his order ready and waiting in his kitchen, he checks through the items to ensure they have all arrived in the correct quantities. It seems more mushrooms have been supplied than were ordered, so when Tom approves the receipt of the order in his stockIT system he amends the amount of mushrooms ordered to reflect the amount delivered. This automatically populates Tom's inventory list with the newly supplied quantities which in turn updates the number of burgers and pizzas Tom is able to create from the recipes linked to those items.

SIMONS SHOES

Let's look at another example, this time from a retail perspective. In this scenario, Simon has decided to fulfil his dream and open a shoe store – “Simon's shoes”. After undertaking a vast amount of research, Simon has decided to use stockIT as his chosen inventory management suite. While his shop undergoes a fit-out, Simon gets to setting up stockIT and its systems. Simon has chosen a PoS system because of its integration with stockIT and his chosen cloud-based accounting software. After meeting with various suppliers, even finding a few through stockIT's supplier marketplace functionality, Simon goes about entering each product into his stockIT software, completing a full unit profile for each item. This allows him to set the price, applicable taxes, store storage and overstock locations, enter supplier information and the inventory management formulae for each item. As the store is only just opening, Simon has no historic supply data to base his purchasing on and so simply orders what he believes to be the right amounts using the stockIT purchase tool. As each new delivery arrives, Simon approves, denies and amends the orders to keep accurate track of each item.

Simon's Shoes is a huge success and his customer service focussed approach is getting him a lot of praise. By using stockIT Simon has to spend less time cataloguing orders, checking inventory and keeping track of his stock than his competitors and is able to do more of what he loves – selling shoes!

Next on the cards is a new store. The new store is in a smaller location on the high street, therefore Simon will have less room for extra inventory storage at the location and must keep a close watch on his inventory numbers. To do this, Simon utilises the SILO approach inbuilt into stockIT. He sets his first store as the central SILO and the high street store as a secondary SILO. All inventory items coming into the high street store will be inventoried using the 'just in time' supply formula, meaning he can keep a lower quantity in-store before StockIT re-order or low-stock alerts are triggered.

Using the first store's historic supply and purchase data, Simon calculates the safe-stock levels for each item in the high street store. As the high street store is now treated as a SILO within the Simon's Shoes organisation, Simon is able to set stockIT to trigger re-order or low-stock alerts when an item in the high street store reaches a certain level. Simon can then see at a glance the number of that item in the inventory of his much larger first store (the central SILO). The low-stock and re-order alerts can be set

up to trigger when inventory reaches a certain level at a specific SILO or across all SILOs. This means that rather than having to purchase more inventory for just one SILO, Simon can simply move inventory between locations, place an order for a customer to collect from his other store or place a purchase order for both SILOs. The SILO feature means that Simon can always be across the inventories of each store, their individual inventory levels and the current stock levels of each store. It also allows Simon to create marketing pushes or discounts tailored to the inventory levels of each SILO to help move dead or idle inventory.

Simon is also able to utilise the artificial intelligence integration of stockIT to adjust his purchasing to suit predicted trends and purchase behaviour as his historic sales data grows.

ARTIFICIAL INTELLIGENCE INTEGRATION

Artificial Intelligence can be an incredibly powerful tool when it comes sifting through and collating large amounts of data. As a branch of computer science, “Artificial Intelligence is focussed on the creation of intelligent machines programmed to work and react like we humans do” (How Inventory Control Can Benefit from Artificial Intelligence - Unleashed Software, 2021), with the AI’s specific targets being learning, planning and problem solving.

This means that with the help of Artificial Intelligence, stockIT’s software suite is able to learn and predict a user’s purchase and supply behaviours, predict lead-times, offer deployment advice and give advanced warning of overstocks and shortfalls in inventory on hand.

In stockIT, the Artificial Intelligence will only recommend actions to be taken and will never take those actions itself of its own volition (unless instructed to). The AI incorporated into the software acts more as a canary in the coal mine, running through multiple scenarios and situations to advice the user of the current situation and the potential outcomes.

For example, a hospitality business has been using stockIT’s inventory management software for a period of 6 months. stockIT has learnt from inventory data and by being integrated into the businesses PoS software, that the business has their busiest period of the week on a Friday between 12:00pm and 2pm. The learning the stockIT system

has done over the course of 6 months: monitoring what inventory items have been entered into the system from purchases; when they have been sold (in this situation even down to the specific time of day); how many have been sold (this can operate in a predictive manner over a greater period of data sets i.e. compare data from this period to the same period 12 months ago) and is able to notify the business that they have not ordered enough of a certain product, to meet the expected demand of an item on their menu. stockIT knowing the lead-time for delivery of this item is 12 hours then gives the user the option to order the item by Thursday for a Friday delivery.

This example may seem simple and even intuitive to a person. If am out of this item that means I cannot make this product and I will need to order the item by this time to be able to provide the product. But in the same sense this is where stockITs Artificial Intelligence is crucial to a business's inventory management. A person can make mistakes and perhaps miss an item in purchasing, they can also under order an item or perhaps the person that usually does the purchasing is away on leave. stockIT provides the business with a safety net, a level of security and foresight that means that the element of human error can be mitigated in the purchasing and inventory management process. This can assist in preserving and maintaining a business' reputation, by ensuring that they can always meet the demands of customers.

In the same way, stockITs Artificial Intelligence can collect information on undersold or dead stock. This information can then be provided to the user on a set basis (weekly, monthly) to allow the business to create marketing specials or promotions around the undersold or dead stock inventory items. This reduces the businesses capital tied up in the inventory and prompts sales by the business' clients or guests. Over-orders are another problem that many businesses face. Using stockIT a business can identify where overorders are being created, which products or items are being overordered and then use that information to create promotions or direct marketing towards those products. Dead stock, overstock and idle inventory can hold up a large percentage of a businesses operating capital and budget. Inventory that moves, arrives just in time and is sold in a prompt manner means a business can spend less time managing inventory and more time creating sales improving end products and customer experience.

THE BUSINESS MODEL

stockIT will operate using a subscription model, rather than as a once off purchase, but will give users the option of paying for a subscription for up to 24 months at a time for a discount. This also allows a user to budget their overheads and cut down on unnecessarily repeating transactions, thus cutting down their time spent accounting. As stockIT is designed for a scaling business, we believe that offering our users greater flexibility with their billing periods, subscriber agreements and functionalities we can convince them to make the switch to stockIT.

By operating using a subscription model, stockIT can provide consistent updates to its users, without requiring license repurchasing for a user to receive updates to the software. It provides for a much lower barrier to entry, allowing more businesses to take advantage of the software for a much lower upfront investment than the traditional perpetual license model. For a new business, the initial cost of setting up and purchasing software can have a huge impact on a businesses operating capital and be the deciding factor when choosing between competing software packages.

“The Box outside the Box of Inventory Management.”

— stockIT Team

A key concept of stockIT is establishing a thriving supplier and purchaser ecosystem. With the lower barrier to entry that comes with a subscription model, we are able to actively encourage the growth

of this ecosystem. With more purchasers using the software, more suppliers will be willing to come on board and vice versa. The more users we have populating this ecosystem the faster our Artificial Intelligence integration is able to gather data to learn and grow and become more effective. Once a critical mass of users is achieved, the ecosystem becomes self-sustaining. We can then offer referral promotions to users for referring new users, thereby setting up both the business and the ecosystem to be in a position of constant recruiting and constant growth in a cyclical manner.

A subscription model also allows us greater flexibility in trial periods and tiered offerings. In terms of a trial period, a subscription model allows us to give a potential user access to a basic list of stockIT utilities with core functionalities. This keeps the true depth of stockIT locked away in the subscriber tier. This encourages users enjoying

their experience with the software to purchase a subscription to unlock more functionalities.

Once a trial subscriber has come aboard, we are then able to provide tiered subscriptions to suit their current business and their projected business growth. For example, if a small upstart single site business comes a board, we can tailor the subscription to not include access to SILO's and SILO functionalities. This allows them to grow their subscription and financial commitment with stockIT as their business grows. Once a business like this small single site upstart is already familiar with using the software, heavily integrated within the ecosystem and reliant upon using the software for the operation of their business stockIT becomes the natural choice to stay with when they grow to become a multi-site location. This individual business growth is at the core of stockIT. We can be with a business at every step of its development lifecycle – from seedling to a fully established tree.

Having a tiered subscription model allows us to present a potential user with an array of options to help solve their problems. Increasing the marketability of the stockIT software, thereby increasing the size of the ecosystem and ongoing users.

All this is to drive the profitability of the stockIT company. A subscription model means a constant and predictable source of income to support the growth of stockIT as a company. At first, a small development team will create a working prototype of the stockIT software, this will then be marketed towards seed investment firms already operating in the Cloud software, tech start-up fields. If investment is secured, we will continue to develop the software further to create a working version of stockIT to allow roll-out and marketing towards small start-up retail and hospitality businesses. At first, the focus for stockIT will be to find like-minded businesses with clear growth potential, this allows stockIT to grow alongside a business, where new functionalities can be created and designed with input from the end user.

Note: In terms of this assignment, a working model of stockIT will be created with a group members pre-established hospitality business in mind. This will allow us to create and model functionalities of stockIT with real data sets and tangible benefits in mind. It will also allow us to implement features and test their use in a real-world scenario. Whilst a significant investment of time, resources and skills would be required to bring the end product of stockIT to market, we believe that by using a real world set

of data and information obtained for this business we will be able to demonstrate key functionalities intended to be in the end product.

THE TOOLS AND TECHNOLOGY

When it comes to creating a fully functional software suite, there are several different tools and technologies that come into play.

Both applications and systems development are key areas to be implemented. Application development to build out the user side of the program, systems development to build out the back-end databasing, network operations and securities aspects of the stockIT software suite.

Our exact programming language will come down to our developers, early builds will likely be built using an element of Python with a transition being made into Java or C++. C++ is useful for any web-browser based functionalities of the software with Java being useful for a large range of application-based programming – especially in this instance with the standalone program aspect.

“SQL is a standardised programming language that’s used to manage relational databases and perform various operations on the data in them”. (What is SQL (Structured Query Language)? - Definition from WhatIs.com, 2021). SQL will be heavily involved to build out the database of the software and is possibly one of the more important aspects of the inventory software itself. Using SQL we can create large data structures and databases and have full access in modifying, updating and changing the data. Data Manipulation Language (DML) and Data Definition Language (DDL) are then used in unison as part of SQL. DML vocabulary will be used to retrieve and manipulate the data whilst the DDL statements are used for defining and modifying database structures (What is SQL (Structured Query Language)? - Definition from WhatIs.com, 2021).

stockIT will be first be built to operate on Windows and Android System, therefore a knowledge of the Android Software Development Kit (Android SDK) Is required. The Android SDK can utilise Java and C++ (which will be our preferred programming languages) and will allow us to build out our android app for stockIT in a relatively quick and straight forward manner. Android SDK also allows us to run profiling and bench marking, to test the performance and viability of the Android App version of our

software. Further down the development lifecycle and roadmap of stockIT we will look to build out the Apple version of our application. To do this we will need to become familiar with the Swift programming language. Swift was developed by Apple Inc. as a replacement for Objective-C (Swift (programming language) - Wikipedia, 2021), and is an excellent language to use when building applications specifically designed to run on an Apple operating system.

Cloud computing and cloud infrastructure will also play an important role in some of the key functionalities of stockIT (SILO's) and so a firm understanding of how Cloud computing works will be required. Whilst the data and information used by stockIT can also be accessed on a local storage only basis, cloud computing plays an integral role in sharing the inventory information among different wireless devices connected to the same stockIT account. The cloud infrastructure component allows us to offset the storage costs of the data, utilising pre-built cloud data storage centres. It will also utilise the user's own machine as the host and central storage location for the data, with periodic back-ups of the data available both on the cloud and locally. It also allows the user to interact with the data in a virtualised way given the user interface provided by the stockIT software.

The aforementioned tools and technology are the lynchpins behind the stockIT system. Many more separate tools and technologies are required to really build out the software suite, but we believe these components are integral to the success of the platform itself. A list is provided below of tools and technologies that are more than likely required for the full implementation of the stockIT software with some notes attached and assigned to a position with the roadmap.

Tools and Technology list:

- fluency and expertise in either Java, C++, Swift and Python
 - for program development and implementation
- using the Android Software Development Kit (Android SDK)
 - for android application creation
- experience and knowledge working with SQL
 - databasing, DML and DDL
- knowledge of cloud Infrastructure and Data storage

- required for cloud data sharing aspect of the program
 - key for SILO development
- MariaDB
 - databasing language
- Artificial Intelligence integration and development [end-game features]
 - machine learning models
 - in this instance, we will have to outsource development of the artificial intelligence
 - Artificial Intelligence will unfortunately likely not be part of the proposal we can put forward initially and will have to be delayed to further in the timeline
 - in its place we will need work-around solutions to notification and alert systems.
 - possibly have the stockIT system allow a user to set a “safety-stock” level for each item. With alerts generate and sent to the user when an item reaches a certain level.
 - Chatterboxes
 - natural language tools
 - Artificial Intelligence used to read and understand data
 - Predict trends
 - Alerts for inventory issues
- Extensible Markup Language (XML)
 - useful for creating data structures
 - tied directly to API's used to display the data created with the XML's
- material design language guidelines
 - guidelines for publishing applications and software
- Apple Human Interface guidelines
- exporting data to CSV and associated databasing
 - creating spreadsheets and data from the inventory data that can be used in different formats by the user.
- back-end PoS design, architecture and data storage
 - an in-depth understanding of how Data from stockIT can be fed to and from the PoS system used by the user.

- how this data is presented by the PoS
 - how the data is collected
 - integration and communication between stockIT and the PoS
 - how a PoS system works – eftpos, storage, data management
- wireframing
 - used to map and create UI and UX concepts and articulate how stockIT will look.
 - low fidelity for basic and first drafts.
high fidelity for close to finished product and versions.
- GitHub for project data sharing in creation and development phases.

The tools and technology section is a difficult segment to surmise. Over the journey of stockIT, the development group and myself will learn a lot and grow our skills in the technology sector. The feasibility of stockIT as a whole software product is at the forefront of the development group's mind, we are realistic about our approach and our roadmap.

DELIVERABLES FOR ASSIGNMENT 3

The stockIT that you see above is the endgame for its development. For assignment 3, we will make steps towards completing the below elements for our presentation. A HTML interface will be built for the stockIT system based on wireframe designs. While the functionality of the HTML system may be reduced due to the smaller database, we aim to have a functioning system based on the information from a group member's hospitality business. The wireframes will extend to cover the web version, software version and mobile version of stockIT. Wireframing will be a very useful tool for us to be able to present our vision to our audience and provide a visual guide. The MIT app inventor software will be used to create a functional mobile version with scaled back elements of the endgame version of stockIT. Python is a programming language most group members are familiar with, however we are concerned with its integrational power and so will be leaning into a group member's current experience with PHP, MariaDB and Java. Extensive research will be carried out into Artificial Intelligence and how it could be integrated, however due to the limited time and resources for assignment 3 there will not be any implementation that can take place. We do understand the large undertaking that is stockIT and made a deliberate choice to aim high

with its possibilities and scale back the functionalities for assignment 3. It may seem counterintuitive, but we believe by doing this we can and will expose ourselves to more concepts and ideas that we can research and explore, thereby learning more throughout the process.

GROUP REFLECTION

THE GROUP'S REFLECTION

Overall, we consider it to be a very positive experience to be able to work together as a team. Each of us took responsibility for our allocated roles and tried our best to make a positive contribution. Fortunately, we did not encounter any impassable issues in terms of collaboration and teamwork. When a team member requested feedback, many of us actively participated in the discussion and provided constructive opinions.

Please find an example of our active forum of achieving a better outcome shown below.

Monday 10:47 am

Taylen Anderson 03/10/2021 8:18 pm

how do we feel about the dark color either side of the content?

I do not like a dark theme in general but it is my personal preference.

HH

Hugo Hughes Monday 10:56 am

I think replacing the black with a soft white would look more professional (I love using dark theme - but would think a lighter theme might better match our idea), I think the contrast between the black and the rest of the colours is too harsh - could potentially experiment with a lighter black/grey if we want to stick with the dark theme.

I would think team profile tab section the column height could be fractionally greater.

Otherwise - this is looking really promising Taylen - good work so far!

TA

Taylen Anderson Monday 11:27 am

Cool I will make it match our nav bar

Assessment 2 -My profile – Group # 12

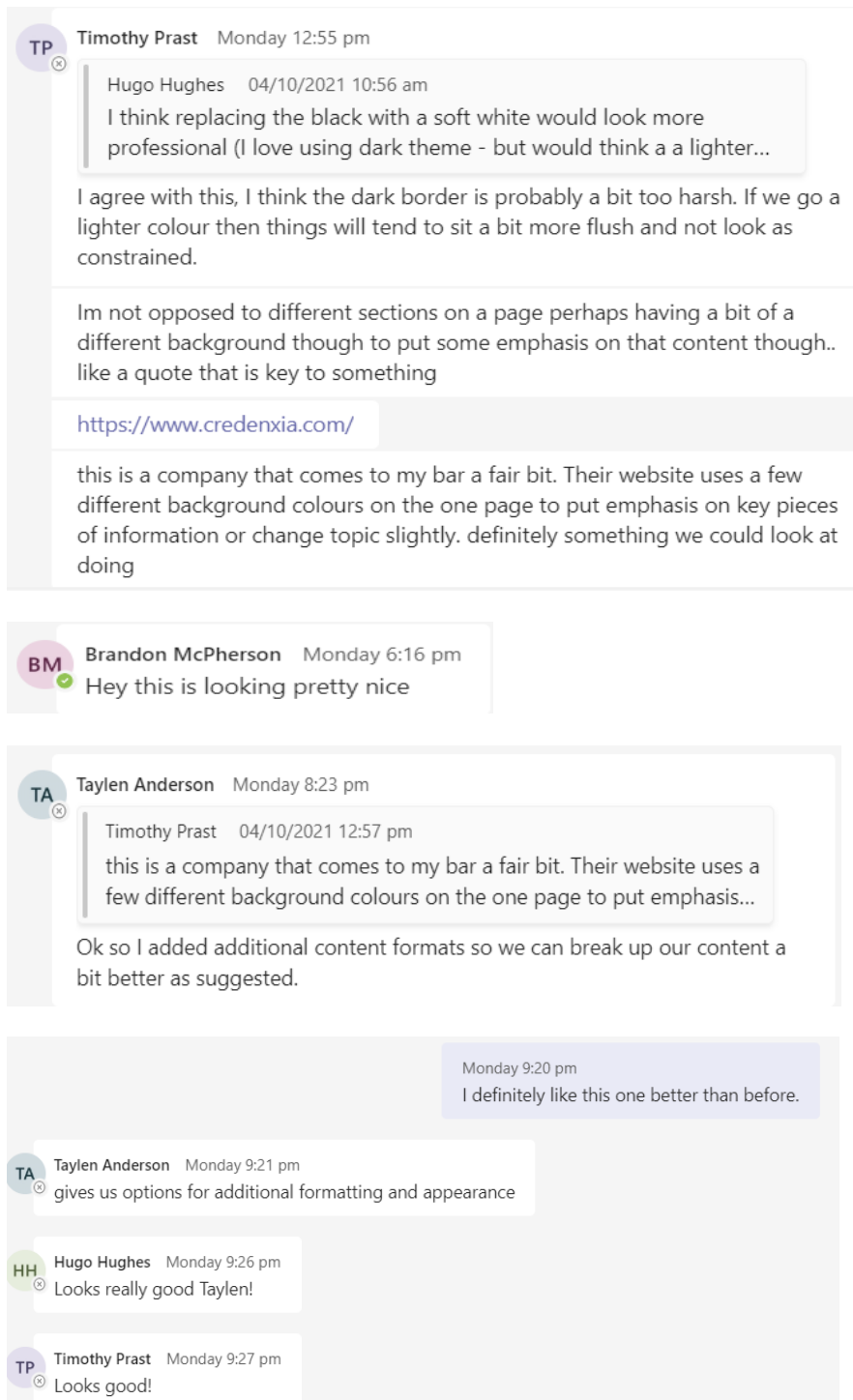


Figure 20 - Image captured from Teams chats area for Group # 12
Source: Microsoft Teams, 2021

We have conducted similar brainstorm sessions (as to the example above) via Teams chats almost daily while maintaining formal online meetings twice a week.

Overall, we feel that our engagement in our bi-weekly meetings have made some level of improvement over time. Although we struggled to keep it structured initially, we quickly learnt to hold it more efficiently by strictly following a pre-agreed agenda. An-

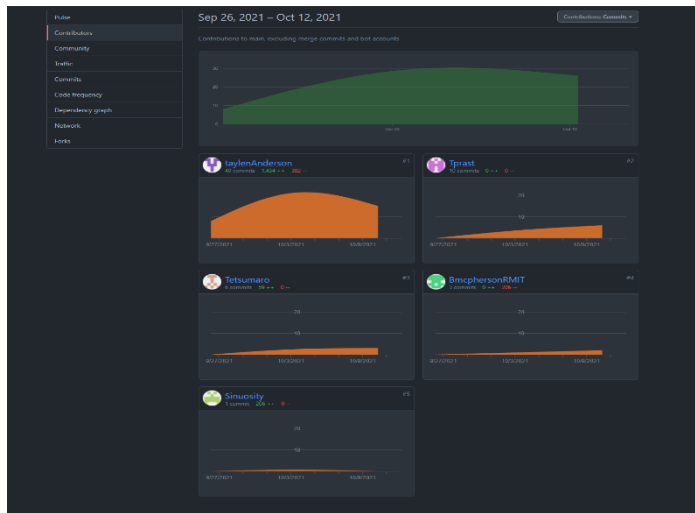


Figure 21 – GitHub Traffic graph of stockIT repository
Source: GitHub, 2021

other positive aspect of our team collaboration is the cross-sharing of our knowledge base. Through exchanging our first assignment and its feedback, we came to the conclusion that some members might have skillsets that were better suited to different content areas for assignment 2. In our team, experienced members were encouraged to share their expertise with others, creating a positive learn-

ing environment for the group. Examples were when Taylen assisted others in setting up the group's GitHub with his self-made Youtube and when Brandon proofread the work prepared by a non-native English member.

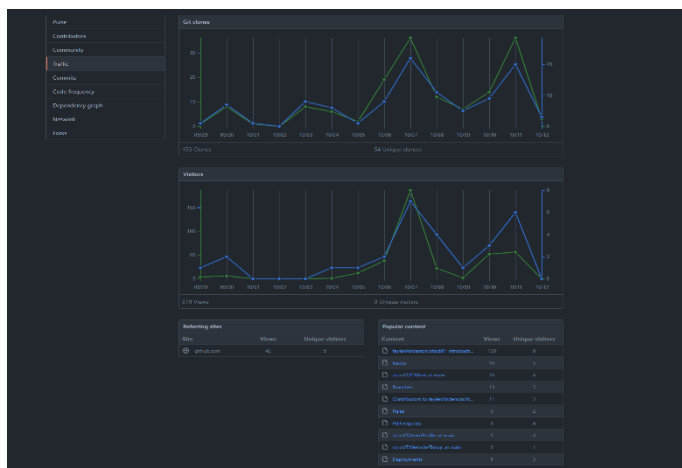


Figure 22 – GitHub Commit graph of stockIT repository
Source: GitHub, 2021

We used the chats function in Teams for daily communications among members. While our daily chats were a great way for everybody to stay in touch and provide daily updates on the progress of their assigned section, we feel that this may not have been the best way to maintain our conversation records. Although we tried to keep a separate chat log for each topic, our chat history has cluttered over time, and become hard to review the past conversations. One solution may be to use the channel function or SharePoint instead of the chats function. We plan to have a planning session to brainstorm this further prior commencing assignment 3.

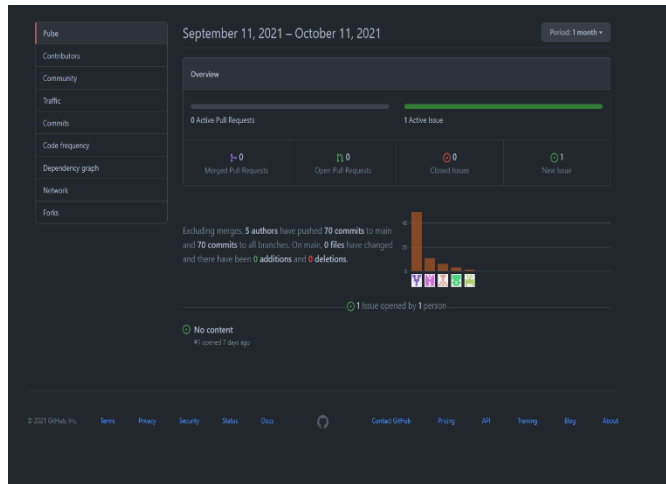


Figure 23 – GitHub Gitpulse History of stockIT repository
Source: GitHub, 2021

We have learned the hard-working nature of our group. The commitment and dedication of each member toward this assignment has been remarkable. It demonstrates our determination to succeed as mature-age students. Most of our members worked full time during the day while dedicating nights and weekends to study. We refused to waste our time and strived to take advantage of this learning opportunity.

To some extent, it was surprising to find that we functioned very well as a team. According to our [personality tests](#), we were a relatively introverted group of individuals. We had concerns that this fact would negatively affect the way we could collaborate as a group. We are proud of overcoming our initial concerns and believe we have formed a well-organized team with a positive and supportive culture.

Each member surprised us for their uniqueness and intelligence. Ahmet is generally a quiet person but makes simple yet effective comments when he speaks up. Brandon has excellent interview skills, which surprised not only the team but also himself. Hugo has amazing people skill at such a young age. Taylen always surprises us with how skillful he is with IT. Tim is a well-balanced businessperson who is logical, thoughtful, and assertive. Tetsu is a hard-working individual who still enjoys studying in his mid-40s. What surprised us was that we all had unique strengths that positively impacted the team.

MEMBERS' REFLECTION

Ahmet Akgun

Our team formed soon after the assignment period started. In our first meeting, we've become familiar with each other and discussed a draft plan about what our next steps will be. From the second meeting, we've started to allocate our tasks and formed alternative plans if the necessity arises. After the third meeting, we have set out for our tasks. Towards the last two weeks, I sustained some setbacks which caused me a delay in my deadline. Thankfully, another member of our team shared my burden and completed one of the reports about an information technology subject. I have learned that as an individual I can accomplish something but as with a group I can learn and gain much more.



The group communicated frequently and openly. We have expressed our opinions and intentions. No room was left for miscommunication. Due to each member having different life commitments, sometimes it was difficult to agree on a schedule for meetings. After discussing it thoroughly, we have set and met our schedules.

Brandon McPherson

My initial thoughts beginning group work for assessment 2 was rather overwhelming as this is the first time engaging in group work on an academic level. At first, I wasn't sure what to expect as my personality test from assessment 1 suggests that I was quite introverted and so interacting with 5 strangers would be rather difficult for myself to open up. However, I surprised myself on the level of engagement and contribution from everyone. Our first few meetings were a little disorientated and unorganised, it wasn't until before our third meeting that there was some tension within the group, it was clear that we needed a leader.



Tetsu took the initiative and nominated himself as the project leader, he developed a very well, thought out project plan on an excel spreadsheet via teams and assigned each member their role and deadline dates. We now had clarity of our objectives; this

was vital for our group's success. Tetsu's leadership was nothing short of amazing, he was very inspiring and great to work with.

I was quite impressed with Hugo's IT Industry data, he went above and beyond by seeking other data sources to compare that with Burning Data, he was very engaging in meetings.

Tim's level of work ethic was self-evident, he produced exceptional work for his IT Technology and the IT project, Tim was not only engaging in meetings but was also attentive.

Taylen displayed a level intuitiveness by building an astonishing video which assisted us all in using GitHub. As we began to push content to Git, he a remoted onto our computers and assisted us with the process. He took on all our ideas and his own to build a professional website to display our content.

Ahmet was going through a tough time as his computer died however, he still attended meetings, provided input, and completed two of the IT Technologies which displayed a great deal of dedication.

Throughout the weeks, I've had the pleasure of working with some great people whom I would easily work with again. I'm still not convinced that all group work will be collaborative as this one was but I'm glad that my overall opinion of group work has changed and excited to begin assessment 3.

Hugo Hughes

We worked well as a team, especially given that we were initially a group of complete strangers. We leveraged each other's strengths well and bridged gaps where there were weaknesses effectively. As a group I felt we were quite accommodating of people's schedules and priorities outside of university, resulting in a constructive and positive environment.

What could be improved?

It's quite minor, but if we could have had a finalised version sooner than we did, it would have made life a little easier. But realistically with people's commitments outside of work, with various states and areas going in and out of lockdown during the assignment period, I believe we did quite well.

At least one thing that was surprising.

I was surprised at how little major issues we had. There were some setbacks, but as a group we worked collectively and proactively to work towards submitting an assignment that we are all proud of. I was expecting greater issues and for it to be quite stressful, but it has not been my experience personally.

At least one thing that you have learned about groups.

The most important thing I have learned about groups is that it is all about the mindset. As our personality profile shows, we all have different and unique personalities, but we were all driven by one goal to submit a quality assignment. Consequently, I think we worked effectively given that we have never met in person.

Taylen Robert Anderson

When I initially joined this group, it was quite late in the piece. I was invited by our teammate Hugo, he seemed very enthusiastic and happy to work with me. Once we had our first meeting, followed by our second I was starting to worry in regard to how our group would work without central management. From a brief discussion we were able to determine our project leader Tetsu, who was able to quickly turn us around and direct us into a clean and efficient meeting three. From this point we were able to quickly delegate tasks and start getting our project moving onward.



The group tends to over communicate in a group setting when it may be more beneficial to communicate directly to the affected people. This has the unintended side effect of causing us to lose information before it is saved and organised. The upside of this is generally the group is full of very happy and easy people to get along with. Any problems or tasks running behind, or any help needed is very easily and quickly accommodated.

All in all this has been a very interesting experience, and I am extremely glad I have had the pleasure of working with this amazing team.

Tetsu Watanabe

I believe that we worked very well as a team. After we allocated tasks to each member, we actively tried to assist others when time allowed. We brainstormed daily despite our busy work, and our numerous chats histories prove our daily collaboration.



Figure 24 –Image captured from Chat section of Microsoft Teams – Group # 12
Source: Microsoft Teams, 2021

One improvement that we can make for the next assignment may be a better use of project management tools. We used an excel spreadsheet to manage the work in progress and chats function for the team communication. Perhaps, we can consider implementing additional tools to manage both project planning and our conversation records. As Brandon suggested initially, it may be a good idea to evaluate the use of SharePoint.

I admit that I was pleasantly surprised by each of my teammates.

Ahmet surprised me with his intelligent hobbies such as chess and cosmology. Brandon is a person with fantastic literacy skills, which include not only writing but also interviewing skills. Despite his young age, I found Hugo is the best communicator who always brings our team a positive atmosphere. Taylen is a very effective self-learner who is also an outstanding teacher. As a business owner myself, I admire Tim's determination to run his business and study simultaneously.

It was an absolute pleasure to be surprised at each member's talents and persona.

Through this assignment, I was pleased to learn that we all determined to work as a team to achieve the best outcome possible. I, therefore, commit myself to support the team to the best of my ability.

Tim Prast

Group assignments can be a daunting prospect in any university curriculum. Often times when I see a group assignment as part of a unit I become filled with an impending feeling of anxiety, “what if we don’t work well as a team”, “what if our personalities clash” and “what if one member does not perform”. It is entirely safe to say that our group for this assignment has far exceeded my expectations.



I’ve found all the group members to be proactive, communicative and team orientated. I do believe we had some teething issues at the start, as with all groups, I believe we were all too willing to compromise and allow others to lead with group members not wanting to step on another’s toes. However, an abundance of politeness and willing to compromise can also be a great thing in a new team environment as it allows each member to get a feel for the other and see how we all work.

Tetsu created an excellent spreadsheet to break down all the assignment requirements to help us divide the tasks. This was done in a very democratic way with each member letting the others know their preferences, perceived weaknesses, and strengths. Once the tasks were divided, we broke our Microsoft teams chat down into separate chats with the assigned members to facilitate better communication.

Weekly meetings allowed us all time to chat, get to know one another and collaborate and work on our assignment. Brandon showed great initiative in organizing, conducting, and facilitating an interview with an IT professional. Hugo’s boundless enthusiasm and quick wit also brought some laughter and smiles to the meetings – Not to mention is talent for writing and communicating. Taylen created an entire YouTube video to help members use GitHub to share our assignment, built our assignment website and has always been quick to help other members with problems. Ahmet worked tirelessly to complete his research task and although a quieter member of the group always had sage advice or a well-formed opinion when needed.

I’ve found the entire group assignment experience to be a very welcome surprise. I’ve learnt not to approach these situations with anxiety anymore. Each member brings something new to the table, each member has their strengths and weaknesses, and this is why group work is important, it creates a more rounded, more collaborative

finished product. The group has been an absolute pleasure to work with and I can't wait to continue working with them for assignment 3.

LIST OF FIGURES

Figure 1 - Adobe Spark, 2021. stockIT Logo - Adobe Spark Creation. [image] Available at: <<https://spark.adobe.com/sp/design/post/urn:aaid:sc:AP:6ee9e30e-b915-4eb5-b684-c86e84895fb8>> [Accessed 10 October 2021].

Figure 2- fauxels (2019). Photo Of People Doing Handshakes. Available at: <<https://www.pexels.com/photo/photo-of-people-doing-handshakes-3183197/>> [Accessed 13 Oct. 2021].

Figure 3 - Lukas (2017). Close-up Photo of Survey Spreadsheet. Available at: <<https://www.pexels.com/photo/close-up-photo-of-survey-spreadsheet-590022/>> [Accessed 13 Oct. 2021].

Figure 4 - Knight, A. (2019). High-Angle Photo of Robot. Available at: <https://www.pexels.com/photo/high-angle-photo-of-robot-2599244/> [Accessed 16 Oct. 2021].

Figure 5 - Arroyo, R., 2016. Research Gate. [Online] Available at: <https://www.researchgate.net/profile/Roberto-Arroyo-4/publication/304789242/figure/fig2/AS:380415174037504@1467709453041/Example-cases-of-pixel-wise-segmentation-performed-by-SegNet-on-real-road-scenarios.png> [Accessed 12 October 2021].

Figure 6 -Blue Planet Studio (2020). AI Chatbot smart digital customer service application concept. Available at: <https://www.istockphoto.com/photo/ai-chatbot-smart-digital-customer-service-application-concept-gm1245953915-363130451> [Accessed 16 Oct. 2021].

Figure 7,8,9&10 - 2021. [online] Available at: <<https://www.optus.com.au/notices/messaging>> [Accessed 11 October 2021].

Figure 11 - iStock (n.d.). Automatic car speeding. Available at: https://www.istockphoto.com/photo/ai-driving-in-city-gm1151376270-312022817?utm_campaign=adp_photos_sponsored&utm_content=https%3A%2F%2Fwww.pexels.com%2Fphoto%2Fflight-people-dark-car-6498307%2F&utm_medium=affiliate&utm_source=pexels&utm_term=light [Accessed 17 Oct. 2021].

Figure 12 - Pixabay (2016). Security Logo. Available at: <https://www.pexels.com/photo/security-logo-60504/> [Accessed 16 Oct. 2021].

Figure 13 - RMIT (2021). Digital Certificate from RMIT website. Available at: <https://www.rmit.edu.au/> [Accessed 17 Oct. 2021].

Figure 14 - Wikipedia (n.d.). https://en.wikipedia.org/wiki/Public_key_infrastructure. Available at: https://en.wikipedia.org/wiki/Public_key_infrastructure [Accessed 17 Oct. 2021].

Figure 15 - H, T. 2018. How the Blockchain Works. Available at: <https://rubygarage.org/blog/how-blockchain-works> [Accessed 15 Oct. 2021].

Figure 16 - H, T. 2018. How the Blockchain Works. Available at: <https://rubygarage.org/blog/how-blockchain-works> [Accessed 15 Oct. 2021].

Figure 17 - Lily, T. (25AD). Shelves on a Warehouse. Available at: <https://www.pexels.com/photo/shelves-on-a-warehouse-4483608/> [Accessed 17 Oct. 2021].

Figure 18 - Adobe Spark, 2021. stockIT Logo - Adobe Spark Creation. [image] Available at: <https://spark.adobe.com/sp/design/post/urn:aaid:sc:AP:6ee9e30e-b915-4eb5-b684-c86e84895fb8> [Accessed 10 October 2021].

Figure 19 - Adobe Spark, 2021. Example of stockIT's SILO system - Adobe Spark Creation. [image] Available at: <https://spark.adobe.com/sp/design/post/urn:aaid:sc:AP:6ee9e30e-b915-4eb5-b684-c86e84895fb8> [Accessed 10 October 2021].

Figure 20 – Microsoft Teams, 2021. Image captured from Microsoft Teams chats area -Group # 12. [image] Available at: <https://teams.microsoft.com/l/team/19%3a9Myjlii3NQaWmcpGtjxWffQmZgmL-1rA13fQ8CUmn6g1%40thread.tacv2/conversations?groupId=24f3f6bd-b9be-4a72-8a4f-c982e853354a&tenantId=d1323671-cdbe-4417-b4d4-bdb24b51316b> [Accessed 11 October 2021].

Figure 21 – GitHub, 2021. GitHub Traffic graph of stockIT repository. [image] Available at: <https://github.com/Tetsumaro/stockIT/graphs/traffic> [Accessed 12 October 2021].

Figure 22 – GitHub, 2021. GitHub Traffic graph of stockIT repository. [image] Available at: <https://github.com/Tetsumaro/stockIT/graphs/commit-activity> [Accessed 12 October 2021].

Figure 23 - GitHub, 2021. GitHub Commit graph of stockIT repository. [image] Available at: <https://github.com/Tetsumaro/stockIT/pulse> [Accessed 12 October 2021].

Figure 24 – Microsoft Teams, 2021. Image captured from Chat section of Microsoft Teams – Group # 12. [image] Available at: <https://teams.microsoft.com/l/team/19%3a9Myjlii3NQaWmcpGtjxWffQmZgmL-1rA13fQ8CUmn6g1%40thread.tacv2/conversations?groupId=24f3f6bd-b9be-4a72-8a4f-c982e853354a&tenantId=d1323671-cdbe-4417-b4d4-bdb24b51316b> [Accessed 11 October 2021].

REFERENCES

Team Profile

www.goodreads.com. (n.d.). Phil Jackson. [online] Available at: https://www.goodreads.com/author/show/2853.Phil_Jackson [Accessed 16 Oct. 2021].

Industry Data

Australian Computer Society, 2021. *ACS – Demands & Impacts on Tech & Digital Skills White Paper 2021*. [online] p.7. Available at: < [Demand & Impacts on Tech & Digital Skills White Paper 2021 \(acs.org.au\)](https://www.acs.org.au/demand-impacts-on-tech-digital-skills-white-paper-2021)> [Accessed 30 September 2021].

Australian Computer Society, 2021. *ACS – Demands & Impacts on Tech & Digital Skills White Paper 2021*. [online] p.8. Available at: < [Demand & Impacts on Tech & Digital Skills White Paper 2021 \(acs.org.au\)](https://www.acs.org.au/demand-impacts-on-tech-digital-skills-white-paper-2021)> [Accessed 30 September 2021].

Burning Glass Technologies, 2018. *Labour Insight Jobs* [online].

Department of Industry, 2018. *Australia's Tech Future*. [online] p.17. Available at: < <https://www.industry.gov.au/sites/default/files/2018-12/australias-tech-future.pdf#:~:text=Australia%E2%80%99s%20Tech%20Future%20sets%20out%20the%20opportunities%20and,ensure%20all%20Australians%20can%20thrive%20in%C2%A0a%C2%A0global%20digital%20economy.>> [Accessed 2 October 2021].

Department of Home Affairs, 2020. *Cyber Security Strategy*. [online] p.9. Available at: < <https://www.homeaffairs.gov.au/cyber-security-subsite/files/cyber-security-strategy-2020.pdf> > [Accessed 3 October 2021].

National Skills Commission, 2021. *Skills Priority List June 2021*. [online] p.6. Available at: < <https://www.nationalskillscommission.gov.au/our-work/skills-priority-list> > [Accessed 2 October 2021].>

IT Technologies - Machine Learning

Arroyo, R., 2016. Research Gate. [Online] Available at: <https://www.researchgate.net/profile/Roberto-Arroyo-4/publication/304789242/figure/fig2/AS:380415174037504@1467709453041/Example-cases-of-pixel-wise-segmentation-performed-by-SegNet-on-real-road-scenarios.png> [Accessed 12 October 2021].

IBM, 2021. Ibm.com. [Online] Available at: <https://www.ibm.com/cloud/learn/machine-learning> [Accessed 12 October 2021].

IBM, 2021. Ibm.com. [Online] Available at: <https://www.ibm.com/au-en/cloud/learn/neural-networks> [Accessed 12 October 2021].

IOSR-JCE, 2021. A Critical Conceptual Analysis of Definitions of Artificial Intelligence as Applicable to Computer Engineering. *IOSR Journal of Computer Engineering*, 16(2), p. 13.

J, N., H, C. & M, B., 2019. Machine Learning: Applications of Artificial Intelligence to Imaging and Diagnosis. *Biophysical Reviews*, 11(1), pp. 111-118.

Marius, H., 2021. Toward Data Science. [Online]

Available at: <https://towardsdatascience.com/overview-state-of-the-art-machine-learning-algorithms-per-discipline-per-task-c1a16a66b8bb> [Accessed 12 October 2021].

IT Technologies – Autonomous Vehicles

Airforce Technology, 2021. *Airforce-technology.com*. [Online]

Available at: <https://www.airforce-technology.com/features/sukhoi-su-57-a-significant-boost-to-russian-air-combat-capabilities> [Accessed 12 October 2021].

Chowdury, M. & Deka, L., 2019. Transportation Cyber-Physical Systems. *Elsevier*, Issue 1, p. 2.1.2.

D, B., 2020. Autonomous Automobilities: The social impacts of Driverless vehicles. *Current Sociology*, 68(1), pp. 116-134.

ISO & SAE, 2021. *Sae.org*. [Online]

Available at: https://www.sae.org/standards/content/j3016_201806/ [Accessed 12 October 2021].

Klein, N., Guilfoyle, D., Karim, M. S. & McLaughlin, R., 2020. Maritim Autonomous Vehicles: New frontiers in the law of the Sea. *Internatiuonal and Comparative Law Quarterly*, 69(3), pp. 719-734.

Li, L., J, L. & S, Z., 2021. *copernicus.org*. [Online]

Available at: <http://ms.copernicus.org/articles/12/419/2021/ms-12-419-2021.pdf> [Accessed 12 October 2021].

IT Technologies – Natural Language Processing and Chatterbots

2021. [online] Available at: <https://www.optus.com.au/notices/messaging> [Accessed 11 October 2021].

99firms.com. 2021. 25+ Chatbot Statistics for 2021 - 99firms. [online] Available at:

<https://99firms.com/blog/chatbot-statistics/#gref> [Accessed 11 October 2021].

Analyticsinsight.net. 2021. Are Chatbots and Artificial Intelligence Killing the Call-Center Industry?.

[online] Available at: <https://www.analyticsinsight.net/are-chatbots-and-artificial-intelligence-killing-the-call-center-industry/> [Accessed 11 October 2021].

En.wikipedia.org. 2021. Chatbot - Wikipedia. [online] Available at: https://en.wikipedia.org/wiki/Chatbot#cite_note-3 [Accessed 11 October 2021].

En.wikipedia.org. 2021. Turing test - Wikipedia. [online] Available at: https://en.wikipedia.org/wiki/Turing_test [Accessed 11 October 2021].

En.wikipedia.org. 2021. Verbot - Wikipedia. [online] Available at: <https://en.wikipedia.org/wiki/Verbot> [Accessed 11 October 2021].

En.wikipedia.org. 2021. Verbot - Wikipedia. [online] Available at: <https://en.wikipedia.org/wiki/Verbot> [Accessed 11 October 2021].

Reshamwala, A., Pawar, P. and Mishra, D., 2013. REVIEW ON NATURAL LANGUAGE PROCESSING. [online] Research Gate. Available at: <https://www.researchgate.net/profile/Alpa-Reshamwala/publication/235788362_REVIEW_ON_NATURAL_LANGUAGE_PROCESSING/links/00463516276f412048000000/REVIEW-ON-NATURAL-LANGUAGE-PROCESSING.pdf> [Accessed 11 October 2021].

Dr Judith Markowitz, 2021. SpeechTechMag.com: Toys That Have a Voice. [online] Available at: <<https://www.speechtechmag.com/Articles/PrintArticle.aspx?ArticleID=30031>> [Accessed 11 October 2021].

IT Technologies – Blockchain-based Public Key Infrastructure

Cromwell, B., 2021. *Massive Failures of Internet PKI*. [Online] Available at: <https://cromwell-intl.com/cybersecurity/pki-failures.html> [Accessed 15 10 2021].

Fedotov, A., 2019. *Distributed PKI: Development and Use Cases*. [Online] Available at: <https://hackernoon.com/distributed-pki-development-and-use-cases-a828287a2e67> [Accessed 15 10 2021].

Fruhlinger, J., 2020. *What is PKI? And how it secures just about everything online* | CSO Online. [Online] Available at: <https://www.csoonline.com/article/3400836/what-is-pki-and-how-it-secures-just-about-everything-online.html> [Accessed 12 10 2021].

Grimes, R. A., 2015. *4 fatal problems with PKI*. [Online] Available at: <https://www.csoonline.com/article/2942072/4-fatal-problems-with-pki.html> [Accessed 15 10 2021].

H., T., 2018. *How the Blockchain works*. [Online] Available at: <https://rubygarage.org/blog/how-blockchain-works> [Accessed 15 10 2021].

Learn, B., 2020. *Explained: What is proof of Work (PoW) in Blockchain?*. [Online] Available at: <https://learn.bybit.com/blockchain/what-is-proof-of-work-in-blockchain/> [Accessed 15 10 2021].

Nakamoto, S., 2008. *Bitcoin: A Peer-to-Peer Electronic Cash System*. [Online] Available at: <http://satoshinakamoto.me/bitcoin.pdf> [Accessed 16 10 2021].

Nexus, University of Michigan, 2020. *The Next Big Thing: The Top Five Emerging Blockchain Technologies*. [Online] Available at: <https://digitalskills.engin.umich.edu/fintech/top-five-emerging-blockchain-technologies/> [Accessed 16 10 2021].

Posey, B., 2005. *A beginner's guide to Public Key Infrastructure*. [Online] Available at: <https://www.techrepublic.com/article/a-beginners-guide-to-public-key-infrastructure/> [Accessed 15 10 2021].

Remme, 2020. *How Blockchain addresses Public Key Infrastructure shortcomings*. [Online] Available at: <https://remme.io/blog/how-blockchain-addresses-public-key-infrastructure-shortcomings> [Accessed 15 10 2021].

Statista, 2021. *Distribution of Bitcoin mining hashrate from September 2019 to April 2021, by country*. [Online]

Available at: <https://www.statista.com/statistics/1200477/bitcoin-mining-by-country/> [Accessed 15 10 2021].

Token Metrics, 2021. *Intro to Blockchain and Cryptocurrencies | An Ultimate Guide*. [Online]

Available at: <https://blog.tokenmetrics.com/intro-to-blockchain-and-cryptocurrencies/> [Accessed 15 10 2021].

Yang, D. H., 2021. *PKI Tutorials - Herong's Tutorial Examples*. [Online]

Available at: <https://www.herongyang.com/PKI/Introduction-What-Is-PKI-Public-Key-Infrastructure.html> [Accessed 15 10 2021].

Project Ideas – stockIT

2021. Spark Adobe - StockIT SILO Graphic. [image] Available at: <<https://spark.adobe.com/sp/design/post/urn:aaid:sc:AP:9b2612eb-6bc6-483b-a1dc-0dfb319e5ec1>> [Accessed 11 October 2021].

Investopedia. 2021. Inventory Management Definition. [online] Available at: <<https://www.investopedia.com/terms/i/inventory-management.asp>> [Accessed 7 October 2021].

SearchDataManagement. 2021. What is SQL (Structured Query Language)? - Definition from WhatIs.com. [online] Available at: <<https://searchdatamanagement.techtarget.com/definition/SQL>> [Accessed 11 October 2021].

SearchDataManagement. 2021. What is SQL (Structured Query Language)? - Definition from WhatIs.com. [online] Available at: <<https://searchdatamanagement.techtarget.com/definition/SQL>> [Accessed 11 October 2021].

Sumo Logic. 2021. What is Cloud Infrastructure? | Sumo Logic. [online] Available at: <<https://www.sumologic.com/glossary/cloud-infrastructure/>> [Accessed 11 October 2021].

Unleashed Software. 2021. How Inventory Control Can Benefit from Artificial Intelligence - Unleashed Software. [online] Available at: <<https://www.unleashedsoftware.com/blog/how-inventory-control-can-benefit-from-artificial-intelligence>> [Accessed 8 October 2021].

Unleashed Software. 2021. How Inventory Control Can Benefit from Artificial Intelligence - Unleashed Software. [online] Available at: <<https://www.unleashedsoftware.com/blog/how-inventory-control-can-benefit-from-artificial-intelligence>> [Accessed 8 October 2021].

WIRE, B., 2021. New Research Report: Retailers Lose \$1.75 Trillion in Revenue Worldwide Due to Overstocks, Out-of-Stocks and Returns. [online] Businesswire.com. Available at: <<https://www.businesswire.com/news/home/20150506005233/en/New-Research-Report-Retailers-Lose-1.75-Trillion>> [Accessed 7 October 2021].

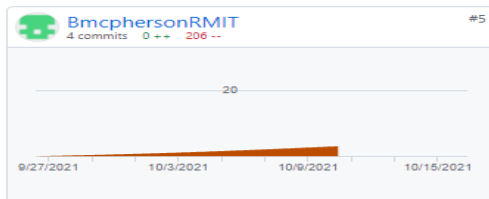
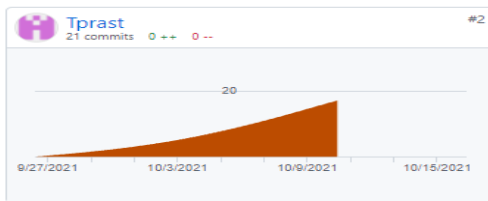
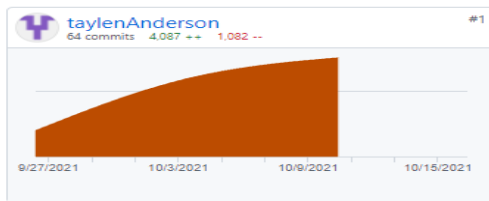
APPENDIX

APPENDIX A

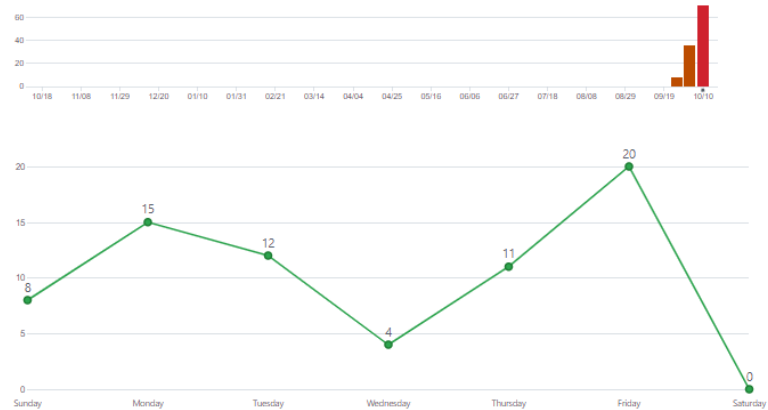
Sep 26, 2021 – Oct 16, 2021

Contributions: Commits

Contributions to main, excluding merge commits and bot accounts



- Pulse
- Contributors
- Community
- Traffic
- Commits**
- Code frequency
- Dependency graph
- Network
- Forks



APPENDIX B

	A	B	C	D	E	F	G	H	J	K	L	M
	Initial task allocation and schedule			Manager	Assis tant 1	Assis tant 2	Assis tant 3	~4/10/2021 (Mon)	~8/10/2021 (Fri)	~9/10/2021 1 Sat	~10/10/2021 (Sun)	~12/10/2021 (Tues)
1			Report Component									
2			Team Profile									
3			Team Name									
4			Personal Information									
5			1 Organize the team to decide a Team name	Tetsu								
6			2 Obtain and summarise one paragraph per person including name, student number, background, hobbies, IT interest and IT experience	Tetsu				Complete the draft				
7			Team profile									
8			3 Obtain and summarise the test outcomes for each person in the team (all 3 tests)	Tetsu							Complete the task	
9			4 Summarise our understanding of how this information may be helpful to the group	Tetsu								
10			Ideal Jobs									
11			5 Compare and Contrast the ideal jobs for each person in the group	Tetsu								
12			Tools (Including Website Component)									
13			6 Decide the basic style, format and layout of the website and share with the group	Taglen	Tim			Complete GitHub set up.				
14			7 Put the website together and submit it as our website for the assignment	Taglen	Tim			Complete the basic layout and website theme	Obtain feedback	Update the website based on the feedback		
15			8 Create links to each individual website on the group website	Taglen	Tim							
16			9 Set up group in Canvas	Taglen	Tim							
17			10 Set up a GitHub repository for the group	Taglen	Tim							
18			11 Include a brief description of what we have done in the report	Taglen	Tim							
19			Industry Data									
20			12 Read (and ask the team to read) industry data supplied by Burning Glass and obtain the feedback	Hugo								
21			13 Determine the job titles for our group's ideal jobs	Hugo				Complete the draft			Complete the task	
22			14 Summarise and report set of skills required for these jobs	Hugo								
23			15 Write in our report if our opinion of ideal job changed? Why or why not?	Hugo								
24			IT Work									
25			16 Decide to interview an IT Professional or pick 10 YouTube videos or web sources	Brandon				Shcedule the interview and draft list of queries				
26			17 Organise and prepare for an interview	Brandon				Complete the interview			Complete the task (Transcript and Recording)	
27			18 Record an interview	Brandon								
28			19 Include raw transcript recordings in appendix to support our written component	Brandon								
29			20 Report on 5 different IT professions as well as indicate 10 sources	Brandon								
30			IT Technologies									
31			21 Report on 4 of the areas (1,200 words @ 4 = 4,800 words)	Ahmet	Ahmet	Ahmet	Hugo	Ahmet to draft at least 1st area (possibly 2)	Ahmet to draft 2nd area	Ahmet to draft 3rd area. Hugo to draft 4th area		
32			Project ideas									
33			22 Discuss, determine and brainstorm the group's project idea	Tim				Complete the brainstorming and planning		Complete the drafts		

	A	B	C	D	E
1	Task responsibility and agreed due date between 20211014-20211017				
2	Tools (Website)			Who	By When
3	1	Website - Industry Data		Taylen	Thursday
4	2	Website - IT Work		Taylen	Friday
5	3	Website - IT Technologies		Taylen	Friday & Sunday
6	4	Website - Project Idea		Taylen	Sunday
7	5	Comments on how well the audit trial on the Git repository reflects your group's work and insert in website and share it with Tetsu for PDF report		Tetsu	Saturday
8	6	Insert Ms Team Information, Meetings, notes and Links to the website - PLEASE READ SECTION 16 OF GROUP DYNAMICS - MS USAGE - ASSIGMENT 2 PAGE 3		Taylen	Sunday
9	IT Work				
10	1	Give Tetsu the wording to put in Report		Brandon	By the end of Friday
11	2	Give Tetsu the link to You Tube		Brandon	Thursday
12	IT Technologies				
13	1	Draft & Complete IT Technology -Blockchain		Brandon	By the end of Friday
14	Project Idea				
15	1	Draft & Complete project Idea		Tim	Friday morning
16	Group Reflection				

APPENDIX C

Link to YouTube Recording

https://youtu.be/134lUKZ_nhg

Interview Transcript

00:00:00.000 --> 00:00:06.490

Brandon McPherson

So thanks very much for ah coming to the interview today Martin as takes a little time out of your day to do this.

00:00:07.670 --> 00:00:11.160

Brandon McPherson

Uhm, so you OK with this being recorded?

00:00:11.460 --> 00:00:13.830

Martin Harrington

Yes, I'm happy for this to be recorded.

00:00:14.080 --> 00:00:19.530

Brandon McPherson

Cool. Uh, are you able to just tell us a bit about your role and what you do?

00:00:20.180 --> 00:00:24.880

Martin Harrington

Sure, uh at the moment I'm working for MS Queensland in Milton.

00:00:25.310 --> 00:00:45.280

Martin Harrington

uh, my job role or job title is systems administrator and being a small IT department, the role is quite varied and it's a mixture of primarily looking after these servers and infrastructure, which are Microsoft Windows based.

00:00:46.810 --> 00:01:10.540

Martin Harrington

Because our company also uses cloud, we look after a number of particular Microsoft Cloud services as well and also look after a bit of backups, hardware and some sort of end user devices such as workstations and mobile phones and support queries that come with that.

00:01:11.150 --> 00:01:19.470

Brandon McPherson

Oh cool, cool. and uh, how does that impact the business at MS Queensland in your role in particular?

00:01:20.700 --> 00:01:21.970

Martin Harrington

Oh look, I mean.

00:01:22.740 --> 00:01:43.240

Martin Harrington

the way I see IT in general is that it's needed by all businesses to operate without it they can't really operate and but basically the role and means that you know by making by keeping everything up to date and running correctly and

00:01:43.290 --> 00:02:01.020

Martin Harrington

and configuring it, configuring it to look after the business needs and it means that the business is able to run smoothly. So, I sort of see it as being a reasonably important part of the uhm, the operations of the business

00:02:02.320 --> 00:02:08.910

Brandon McPherson

Oh, thank you. Uh what was it like when you first began working in IT? Do you find it enjoying or challenging?

00:02:09.890 --> 00:02:39.690

Martin Harrington

Uh, well look I, I mean I started working out in IT after I... Actually, I started before I left for Uni. I had a couple of part time jobs assembling motherboards and things, but when I really started it was a bit of a jump into the unknown. What you learn at university and what it's like in real life, are two different things and I guess the one thing that I did learn is that what you're reading? Yeah, in textbooks and

00:02:40.520 --> 00:03:21.630

Martin Harrington

And study for and how things actually operated are quite, can be quite different and also the one thing you don't really get told too much about is that the sort of people skills you need, because you're usually, in IT. So, if you're not a programmer, but if you're in like a sysadmin, or you do IT support, you end up sort of interacting with all levels of the business, so you could be talking to the CEO if, if a job comes that way, so yeah, that's sort of what I, what I've found, and compared to what I have studied it, it can be quite different.

00:03:22.080 --> 00:03:29.310

Brandon McPherson

I definitely agree there, it's uhm, you know, I think there is this, like this stigma that, you know, IT pretty much.

00:03:29.990 --> 00:03:40.640

Brandon McPherson

Uhm, like very isolated from, from people but that I guess it's not really the case. It's dealing with people on a day-to-day businesses and business and stuff. Yeah.

00:03:41.310 --> 00:03:59.550

Martin Harrington

Yeah. Yeah, because everybody's got a device of some sorts or is using some sort of software and when they need assistance using it or if there's a problem with some hardware, they'll soon, they'll soon come to IT to discuss that.

00:04:01.400 --> 00:04:01.840

Brandon McPherson

Yeah.

00:04:02.530 --> 00:04:15.400

Brandon McPherson

Uh, was there another job in mind, or that you were doing before you got into the IT field? Uh and was there something about the other job or career path that led you into IT or exposure interest into the field?

00:04:15.960 --> 00:04:46.170

Martin Harrington

Ah yeah, look, that's a good question. To tell you the truth, when I was still a student, I kind of didn't have quite a clear idea of what I wanted to do, so I actually did a mixture of business and IT and even during the course then I still wasn't sure. So, when I actually did leave (Uni), my first job was an IT job and it wasn't quite how I perceived it to be, but I stuck with it. So, in all truthfulness since I've left Uni

00:04:46.220 --> 00:05:03.790

Martin Harrington

I've, I've just pretty much been doing, doing IT and yeah. So, if somebody gave me a different role, it wouldn't be, it be, it takes a little bit to get used to. So yeah, look IT has been primarily my, my work since I've finished.

00:05:04.570 --> 00:05:04.990

Brandon McPherson

Cool, cool.

00:05:05.900 --> 00:05:12.310

Brandon McPherson

Uhm, do you engage much with the other areas of the business? And if so, what do you discuss with them?

00:05:15.000 --> 00:05:19.700

Martin Harrington

Ah look, not as much as some previous roles.

00:05:21.350 --> 00:05:51.450

Martin Harrington

I think usually if there's a project that comes up where another part of the business, whether it's marketing, finance, etc that need something, then there's a higher level of interaction, but at the moment it's very ad hoc so it could be anybody who comes by and asks a question and get some, get some assistance or talk about a particular future project. But yeah, there's not a specific part of the business at the moment that I'm dealing with.

00:05:54.340 --> 00:06:00.970

Brandon McPherson

With umm, when you're at University, I guess cause obviously technology has changed quite a bit.

00:06:01.570 --> 00:06:18.280

Brandon McPherson

Uhm, you know, with me doing it now anyway, it seems like it's touching on things like artificial intelligence and machine learning, which I think is fairly, fairly new, or I guess it's uh as a bit more of a trend.

00:06:17.820 --> 00:06:18.740

Martin Harrington

Cutting edge?

00:06:19.330 --> 00:06:33.140

Brandon McPherson

Yeah, what was it like when you're in Uni? What were some of the, I guess the real new things at the time and how's that sort of shaped the IT space now?

00:06:33.450 --> 00:06:42.950

Martin Harrington

Gosh well, it's ah, this is gonna show my age, but I guess as I was sort of really getting doing IT at Uni

00:06:44.380 --> 00:07:02.720

Martin Harrington

The actual, I think underlying operating system was Linux that was running a lot of the systems for the university and umm when I was there, the command line was still quite popular.

00:07:03.480 --> 00:07:47.510

Martin Harrington

that I think windows 3.1 or umm was sort of around, and Windows 95 hadn't come out really by then. So, our talk was about, you know, object orientated programming. It was about the graphical user interface, and it was about talking about you know 32-bit programs, 64-bit hadn't really been discussed so that was that was the cutting edge was that I guess it was the GUI. Windows still booted into the command prompt, but then continued onto loading Windows itself before it was MS Dos. So, so yeah, that was that was where all the excitement was at, at the time.

00:07:48.510 --> 00:08:02.050

Brandon McPherson

And umm, with the GUI, I know that uh, obviously back then it was very popular for I guess, you know, users of, I guess, for the main public to get familiar with computers as the command line can be a bit scary, I guess or intimidating.

00:08:05.860 --> 00:08:06.780

Martin Harrington

Yeah.

00:08:03.250 --> 00:08:25.960

Brandon McPherson

For new users, but I guess now. I guess the GUI for a technician. It creates a lot of space on the, on the memory and hard disk. Is it sort of coming away a bit from the GUI or do you think the GUI is still being pushed?

00:08:26.940 --> 00:08:29.880

Martin Harrington

Uh, oh with the future of the operating systems?

00:08:28.980 --> 00:08:29.280

Brandon McPherson

Yeah.

00:08:30.690 --> 00:08:53.980

Martin Harrington

Oh I think the GUI is here to stay, umm but as you've seen and I've seen, Microsoft found that there was limitations on what the GUI could do. So, they've created PowerShell to really assist sort of administrators and people that needed to really control their computers to be much more powerful.

00:08:55.420 --> 00:09:31.370

Martin Harrington

So I, I still think there's, there's, you know, the GUI will continue to evolve and as Windows 11 is showing and that is always going to be there for either the general end user but the command line will, will always be prominent and I think there are though limitations with the command line and what made the GUI more popular

was the fact that unless you know, that unless you know want to type. You never going to be able to do anything with it, so the GUI was, it was inevitable. Yes...

00:09:31.930 --> 00:09:41.720

Brandon McPherson

Yeah, that's ah that's really good. Uh what, which other aspects of work do you find most challenging within your role?

00:09:42.960 --> 00:10:17.650

Martin Harrington

Umm, I think it's, it's juggling the multiple tasks with limited resources, whether that's not having the funding for enough hardware available to swap, you know to, to swap things out, whether it's enough software licenses and just how rapidly the businesses is changing but at the same time they they're not supporting IT.

00:10:18.790 --> 00:10:28.320

Martin Harrington

Yeah, so I. I feel that that though that's the challenging thing is there's a, there's a lot of business change, but IT is not getting the funding

00:10:29.270 --> 00:10:43.220

Martin Harrington

The support that IT needs to, to sort of adapt and grow with the business for IT to be on the forefront rather than on the always on the back foot. So that that's what my perception is.

00:10:44.280 --> 00:10:55.540

Brandon McPherson

I think yeah, it's funny with like I guess. I know there's some people in uni that they come from all different backgrounds and from different careers. And one thing that sort of stood out to me was.

00:10:57.510 --> 00:11:23.300

Brandon McPherson

As they sort of in their prominent roles at time, they've seen how much IT is evolved and now they've, they're really doing uni to sort of learn it, sort of compliment them. It's kind of, even doing a case study the other day on a bank, they they've transformed their model now from "it's not just a bank, but now a Technology company that does banking or specialises banking."

00:11:22.130 --> 00:11:22.780

Martin Harrington

Right.

00:11:24.310 --> 00:11:41.100

Brandon McPherson

It's kind of. It's funny to see, like maybe that might be something that MS Queensland can perhaps offer or change. Maybe with time or uh, maybe that's a trend that businesses are going towards where they're sort of pushing more or sort of building applications, and I don't know that that's.

00:11:42.070 --> 00:11:45.080

Brandon McPherson

So uh, what, what do you think on that one? What's your thoughts?

00:11:45.170 --> 00:12:14.850

Martin Harrington

Ah, oh look. I mean, banks have large resources to fund those kinds of projects. I think something like MS Queensland might decide to produce an application or get a third party to assist with producing an application that might benefit people were in with their MS. I don't, I don't sort of see that happening at the moment but knowing what the nurse call systems are and

00:12:14.920 --> 00:12:42.520

Martin Harrington

currently being used and paid for by the company to, to look up to assist people with multiple sclerosis. I think there there's certainly room for improvement there and but yeah, it's, it's difficult to say that MS Queensland would have that kind of appetite to produce its own software or become a sort of software led house at this stage, I think they've got some more growing to do before they, they look at that.

00:12:45.200 --> 00:12:49.810

Brandon McPherson

Uh, in what aspects about your job that you find most award rewarding?

00:12:51.100 --> 00:13:21.770

Martin Harrington

Ah, good question. I think that there's a certain level of freedom even though we can use change requests that, that you "know you're the things that you're doing", that they're actually benefiting the company and obviously the end users are the client, the staff, and the people with MS, so where some jobs always feels like you're pushing a pen around, this one you can.

00:13:22.030 --> 00:13:53.470

Martin Harrington

You can put forward suggestions to improve either the software being used, or the way that the end users are interacting with their workstations or devices, and they get listened to, and you know, usually if there is, there's the costs is negligible or none, and it can be supported properly then there's usually an agreement quite quickly to say, yeah we can. We can do that that.

00:13:53.540 --> 00:13:59.340

Martin Harrington

That looks like a good suggestion. So yeah, being listened to by the company and by the IT team is, is great.

00:14:03.790 --> 00:14:16.400

Martin Harrington

that that's one thing. There's nothing. There's nothing better than creating something I think, and that that's certainly what we're able to, to achieve in this role.

00:14:17.170 --> 00:14:26.500

Brandon McPherson

Mmm, that's cool. And like you get, so I guess that's sort of yeah, you get to see that the technology. Sort of I guess helps there. I guess they work as well

00:14:27.070 --> 00:14:28.750

Brandon McPherson

Uhm yeah cool.

00:14:29.350 --> 00:14:36.240

Brandon McPherson

Uhm, are you able to share an example of some of the work that best captures the essence of your role?

00:14:37.440 --> 00:15:03.040

Martin Harrington

The work? Oh gosh, well, if I thought verbally I don't, I'll have to... I think when there were things that I sort of achieved when I came in that I feel shows that would be the, when all the desktops and laptops were sort of running and the mobile phone...

00:15:04.380 --> 00:15:44.950

Martin Harrington

So basically, the end user devices were set up and configured, they were all working, you know, reasonably well, but there was a lot of the management of them, the software and that they're just the general administration of them was a little out of date, so luckily the business allowed us to buy some better Microsoft licensing, which then allowed us to or allowed me to look at moving the devices from just a central computer that managed them into like a Microsoft Cloud based service called "Intune".

00:15:45.020 --> 00:16:12.350

Martin Harrington

and when I think back to when I first started. Some sort of testing it out and seeing what it, what it could do to what it does now. It's become quite like an essential tool to, to manage the machines to deploy software and configuration, and to just keep an eye on what those machines are doing and the Windows updates there was. So now they're, they're more compliant and more standard with Microsoft practices.

00:16:13.120 --> 00:16:36.240

Martin Harrington

So yeah, to me that, that tool now has become, certainly from my point of view quite an essential tool to ensure that people have an up-to-date Windows operating system, or a managed Android phone and we can just yeah, manage and administer it much better than we could before.

00:16:36.540 --> 00:16:42.610

Brandon McPherson

Ah Brilliant, yeah. It's crazy. We've just learned about cloud in our uni studies.

00:16:43.670 --> 00:16:55.060

Brandon McPherson

Uh, could you tell us a bit about... ah obviously, I think from memory or is it cloud that was sort of around since 2008 by AWS?

00:16:55.880 --> 00:17:08.060

Brandon McPherson

Uh, I guess what was it like... were you around when servers, before servers began to be virtualized on computing? Or they, that sort of always been around?

00:17:09.520 --> 00:17:40.910

Martin Harrington

Uh well, like I mean AWS sort have, well I was working in IT and you know you started to hear people talking about it and how, I mean, Amazon Web Services came about because they, they realize they had so much compute power still available that they could maybe offer it to customers as a as a way of them offloading some of their on-premises stuff to work on their servers and the whole name of cloud kind of came about, and

00:17:41.240 --> 00:17:42.170

Brandon McPherson

oh, I don't know that.

00:17:42.690 --> 00:18:09.490

Martin Harrington

Yeah, yeah. I think they just yeah, Amazon obviously had the expertise, and they had the data centres around which were primarily for just optimizing their Amazon website and their back end and they just use that too, then start to offer it to business customers so I guess, sort of seeing the change was

00:18:09.540 --> 00:18:39.410

Martin Harrington

where you started to hear businesses talking about “We're going to”, you know there was the big data talk and all of that was where you know businesses realized they had a limitation on how much they could keep on their on-prem and then there was and I think it will kind of coincided with the having, you know, the cost of having a dedicated Internet line and Ethernet to a data centre just so

00:18:40.090 --> 00:19:03.390

Martin Harrington

because of obviously businesses could move their computers away from the office and put them in a data centre and then it was kind of a natural progression once the back end, once the Internet back end improved and the speeds were there that they could start to maybe move more things away from on-premises where there was that that ongoing cost of looking after the data centre.

00:19:03.920 --> 00:19:33.490

Martin Harrington

Uhm, and knew the risk around, the risk around there being outages, as I, sort of saw in someone I used to work for at Sun Super that they had problems with the flood, the big floods and it caused a lot of issues for them. So, I think there was the appetite from that point on to like go “OK, let's, let's see what we can move off the on-premises the into the cloud because Amazon is now offering it” though

00:19:33.790 --> 00:19:58.020

Martin Harrington

Microsoft was a little bit late to the party and some businesses I noticed were reluctant to go over to Amazon because it was quite a different level of expertise needed for that and there was nothing until Microsoft brought out, I think when they brought out, you know, moving your emails off (to O365) that's when people really started to look at the Microsoft products.

00:19:58.630 --> 00:20:03.010

Martin Harrington

Uhm, and you know Amazon was obviously still offering it, specialized services as well. So yeah, I think that you know “Them seeing it” has made a real difference, I think nearly every business have wanted to move more and more things away, but I remember there being a sense of fear with my colleagues because they were concerned that they were going to lose their jobs

00:20:24.710 --> 00:20:25.030

Brandon McPherson

ah, yep.

00:20:25.210 --> 00:20:46.940

Martin Harrington

because if they move to the cloud, why do they need any of these people to look after servers and things like

that, so that's what I kind of experienced, but so far I think it's just meant that everybody's role has changed so you need to understand and be able to use the cloud services and yeah, that's what I, That's what I've noticed in my time.

00:20:47.800 --> 00:20:55.430

Brandon McPherson

And uh, has using the cloud technologies, has that made your life easier as a systems administrator?

00:20:55.780 --> 00:21:17.800

Martin Harrington

Yeah, I, I think so. Umm, we as sysadmins had to spend so much time out of hours patching servers and building new servers, but thankfully with virtualization that helped a lot as well. So, outages you, you could have enough hardware so you could kind of build, build your hardware up without losing

00:21:18.420 --> 00:21:47.630

Martin Harrington

The end user losing any sort of that time with access to those systems so seeing, seeing the changes has made it made it sort of easier because the, I guess in a way, the responsibility for some of that has now moved off the sysadmin shoulders and onto the cloud provider and as the cloud provider has more redundancy and they've got more expertise

00:21:48.630 --> 00:22:07.370

Martin Harrington

In every single facet in their data centres, it means it takes a bit of the sort of weekly daily maintenance away, routine away from the sysadmin so that they can concentrate on other projects. Other services that are running.

00:22:08.490 --> 00:22:26.660

Martin Harrington

So I think it's been a, it's been a good thing that that there's less time needed to be spent on just general patching and updating on their servers, operating system, and even, even just like the databases and ah, yeah, the hardware.

00:22:27.820 --> 00:22:28.360

Brandon McPherson

Cool, yeah.

00:22:28.800 --> 00:22:47.790

Brandon McPherson

Uh, one last question too uh, where do you see the trend of computers and technology is going towards? Does this Excite you? Or makes you worried a bit about the future? Just before the, you know everything going virtualized and moving to the cloud, you know, I guess you know when you look at shows like Mr Robot.

00:22:48.580 --> 00:22:49.300

Martin Harrington

Yeah.

00:22:48.800 --> 00:22:52.750

Brandon McPherson

Cyber-attacks, so, what's your opinion on that?

00:22:53.220 --> 00:23:24.890

Martin Harrington

oh look, it's interesting that you mention Mr Robot. I think there's quite a bit of fact based in, in those, in that show and I think there's, I think there's going to be a day where, there's going to be that you know, there's always going to be risk when you're getting more connected, but everything is getting more connected and I think that there's going to be a day where there's going to be some big outage on mobile phones, I can see that coming

00:23:25.580 --> 00:23:55.490

Martin Harrington

I think there's going to be some great things where the computers will be, you know, like they've been, already been used, you know, in sort of intelligence to build better CPUs so that the computers themselves are using AI to assist with that and I'm sure that that's helping with building better if more efficient data centres. I think the world needs, needs to sort of have more, more kind of intelligence from AI and, and that, because I think the world is

00:23:55.680 --> 00:24:10.380

Martin Harrington

in a bit of a mess in terms of the environment and that, and we, we need, you know, seeing Covid and obviously the only reason we could get the vaccine was because of the, the raw compute power that was there to, to kind of come up with some, some

00:24:10.000 --> 00:24:11.930

Brandon McPherson

Oh I did not know that, that's crazy!

00:24:12.220 --> 00:24:48.080

Martin Harrington

Yeah, you know that, that could've been the only reason there could have been developed that quickly was because they could throw it into some cloud based, you know, systems that could crunch the data very quickly, umm so I think that there's some great things that they're going to come for it and I think the pace is just going to continue, and I think the price ,once we get over the Covid short, the costs of the, the sort of hardware components at the moment in a couple years, I think there's, you know, technology is just going to continue to be cheaper and when you look at what a smart watch can do now, so I ,I think there's going to be more

00:24:48.310 --> 00:25:00.920

Martin Harrington

Uhm connection with, with what's out there, any device you know you're gonna sort of get a receipt and it's going to be a small receipt or it will be kind of connected to the Internet, something they'll be something like that.

00:25:02.210 --> 00:25:30.960

Martin Harrington

umm I, I think there's gotta be, I'm concerned about how people are becoming so tide to their, their mobile phones, their smartwatches to their devices that there, there's sort of society and the way it interacts with each other and the way that sort of like there's that misinformation and all the, there's the good side of something like social media but there's also the bad side, so I think it's going to be

00:25:31.010 --> 00:25:47.540

Martin Harrington

there's going to be growing pains, but there will be more rules around it just like the Internet was like the Wild

West when it first became popular and used more and everybody could do everything. There's going to be more policing around all their software services and

00:25:48.330 --> 00:26:02.050

Martin Harrington

things such as, you know, social media but I think it's, it's exciting times but how people are going to balance it with reality interacting with the technology and interacting with reality? I think that's where I'm unbothered.

00:26:02.740 --> 00:26:07.330

Martin Harrington

I'm, that's what I'm concerned about. Not, not to worry about Skynet just yet.

00:26:09.170 --> 00:26:22.940

Brandon McPherson

Yeah, I guess that's, that's one thing that gets me really worried, but you know, like, I think one thing, I'm always thinking about is before these systems go into the cloud, like what happens if some malicious, you know software gets

00:26:23.510 --> 00:26:32.380

Brandon McPherson

I mean it, it would be hard for it to do, I'm sure. Yeah, I mean all it takes is malicious software to, you know, enter like, let's say Google's data centre and just sort of start, you know.

00:26:33.270 --> 00:26:42.780

Brandon McPherson

Propagating against their, their systems and you know, like take a big portion of the Internet down, and I guess something that on the Internet. Yeah.

00:26:39.540 --> 00:26:40.100

Martin Harrington

Yeah.

00:26:43.750 --> 00:26:44.110

Brandon McPherson

Yeah.

00:26:44.920 --> 00:26:50.800

Martin Harrington

It's relied on so much just like the, the other day, there was that DNS error

00:26:51.830 --> 00:27:21.060

Martin Harrington

and then it's caused Facebook and Instagram and everything to go down and you know, so many organisations rely on Facebook to communicate with people. So, it, it does make you know it doesn't make me realize, make businesses hopefully realize that they can't just rely on one form of, you know, they can't put all their eggs in one basket that that's the quickest way to sum it up. because if they do, there's going to be these outages, even Microsoft services, you know, we experienced those once in a while service degradation

00:27:21.250 --> 00:27:43.490

Martin Harrington

service degradation with, with their products so yeah, yeah, a business, I think and people just should not always rely, you should always assume that maybe all those photos you've got backed up to the cloud. I've got

my photos on three different providers so that if one goes, if Google goes, I've got Amazon Glacier or I've got Microsoft one drive.

00:27:37.840 --> 00:27:38.270

Brandon McPherson

Wow.

00:27:44.260 --> 00:27:48.510

Martin Harrington

So umm, yeah, don't put your eggs in one basket that, that's my thinking.

00:27:47.740 --> 00:27:48.040

Brandon McPherson

Yes.

00:27:49.390 --> 00:27:59.510

Brandon McPherson

So uh, what do you, just really quickly. What's your thoughts about the evolution of human ethics with, with computers and the privacy and stuff?

00:28:00.380 --> 00:28:03.460

Martin Harrington

Ah yeah, look well.

00:28:04.930 --> 00:28:16.990

Martin Harrington

We, when we joined Gmail or joining Google, get a Google account or Microsoft, we're already agreeing to some, some quite, you know questionable I guess

00:28:18.320 --> 00:28:47.190

Martin Harrington

legislative, not legislation but rules within, within the user terms and conditions. I think the governments have got to keep on top of it because you know, they're the Google and Microsoft and, and Apple and so on all scraping our data and collecting it so they already have a large pool. Even though they say synonymized large pullover information, but we've just got, I think you just have to accept if you say something

00:28:47.240 --> 00:29:24.300

Martin Harrington

if you put something on the Internet, you know, just accept that, that could be used against you. It could be copied, so just, you just have to be mindful of that and I think no matter what rules the government put in place, there's, and even if the businesses abide by them, all it takes is a breach and all your data or some of your data is out there. So, Just yeah, I think you just gotta be guarded and make sure you've got paper copies of things and accept that what you've put out there, could you know, have sensitivities. You just gotta be careful.

00:29:25.750 --> 00:29:32.780

Brandon McPherson

That's really good! Thank you very much for doing the interview with me Martin. It's been really good.

00:29:33.270 --> 00:29:34.060

Martin Harrington

Oh, you're welcome.

00:29:32.830 --> 00:29:38.650

Brandon McPherson

Just taking the time out of your day to do this, so I've, I've learnt a lot, so thank you very much.

00:29:39.100 --> 00:29:41.830

Brandon McPherson

Uhm yeah, thank you.

00:29:42.680 --> 00:29:46.700

Martin Harrington

No worries, Brandon. Thank you for those, they they're good questions. They definitely got me thinking.

00:29:47.360 --> 00:29:47.700

Brandon McPherson

Thanks.

00:29:47.990 --> 00:29:50.330

Martin Harrington

Alright, well thanks very much, bye then.

00:29:50.690 --> 00:29:51.330

Brandon McPherson

Thank you, bye.